

# Chapter 1 Answers

## Exercise 1A

- |                      |                     |
|----------------------|---------------------|
| 1 $7x + y$           | 2 $10t - 2r$        |
| 3 $8m + n - 7p$      | 4 $3a + 2ac - 4ab$  |
| 5 $6x^2$             | 6 $2m^2n + 3mn^2$   |
| 7 $2x^2 + 6x + 8$    | 8 $9x^2 - 2x - 1$   |
| 9 $6x^2 - 12x - 10$  | 10 $10c^2d + 8cd^2$ |
| 11 $8x^2 + 3x + 13$  | 12 $a^2b - 2a$      |
| 13 $3x^2 + 14x + 19$ | 14 $8x^2 - 9x + 13$ |
| 15 $a + 4b + 14c$    | 16 $9d^2 - 2c$      |
| 17 $20 - 6x$         | 18 $13 - r^2$       |

## Exercise 1B

- |              |               |                 |
|--------------|---------------|-----------------|
| 1 $x^7$      | 2 $6x^5$      | 3 $2p^2$        |
| 4 $3x^{-2}$  | 5 $k^5$       | 6 $y^{10}$      |
| 7 $5x^8$     | 8 $p^2$       | 9 $2a^3$        |
| 10 $2p^{-7}$ | 11 $6a^{-9}$  | 12 $3a^2b^{-2}$ |
| 13 $27x^8$   | 14 $24x^{11}$ | 15 $63a^{12}$   |
| 16 $32y^6$   | 17 $4a^6$     | 18 $6a^{12}$    |

## Exercise 1C

- |                            |                            |
|----------------------------|----------------------------|
| 1 $9x - 18$                | 2 $x^2 + 9x$               |
| 3 $-12y + 9y^2$            | 4 $xy + 5x$                |
| 5 $-3x^2 - 5x$             | 6 $-20x^2 - 5x$            |
| 7 $4x^2 + 5x$              | 8 $-15y + 6y^3$            |
| 9 $-10x^2 + 8x$            | 10 $3x^3 - 5x^2$           |
| 11 $4x - 1$                | 12 $2x - 4$                |
| 13 $3x^3 - 2x^2 + 5x$      | 14 $14y^2 - 35y^3 + 21y^4$ |
| 15 $-10y^2 + 14y^3 - 6y^4$ | 16 $4x + 10$               |
| 17 $11x - 6$               | 18 $7x^2 - 3x + 7$         |
| 19 $-2x^2 + 26x$           | 20 $-9x^3 + 23x^2$         |

## Exercise 1D

- |                   |                   |
|-------------------|-------------------|
| 1 $4(x + 2)$      | 2 $6(x - 4)$      |
| 3 $5(4x + 3)$     | 4 $2(x^2 + 2)$    |
| 5 $4(x^2 + 5)$    | 6 $6x(x - 3)$     |
| 7 $x(x - 7)$      | 8 $2x(x + 2)$     |
| 9 $x(3x - 1)$     | 10 $2x(3x - 1)$   |
| 11 $5y(2y - 1)$   | 12 $7x(5x - 4)$   |
| 13 $x(x + 2)$     | 14 $y(3y + 2)$    |
| 15 $4x(x + 3)$    | 16 $5y(y - 4)$    |
| 17 $3xy(3y + 4x)$ | 18 $2ab(3 - b)$   |
| 19 $5x(x - 5y)$   | 20 $4xy(3x + 2y)$ |
| 21 $5y(3 - 4z^2)$ | 22 $6(2x^2 - 5)$  |
| 23 $xy(y - x)$    | 24 $4y(3y - x)$   |

## Exercise 1E

- |                        |                          |
|------------------------|--------------------------|
| 1 $x(x + 4)$           | 2 $2x(x + 3)$            |
| 3 $(x + 8)(x + 3)$     | 4 $(x + 6)(x + 2)$       |
| 5 $(x + 8)(x - 5)$     | 6 $(x - 6)(x - 2)$       |
| 7 $(x + 2)(x + 3)$     | 8 $(x - 6)(x + 4)$       |
| 9 $(x - 5)(x + 2)$     | 10 $(x + 5)(x - 4)$      |
| 11 $(2x + 1)(x + 2)$   | 12 $(3x - 2)(x + 4)$     |
| 13 $(5x - 1)(x - 3)$   | 14 $2(3x + 2)(x - 2)$    |
| 15 $(2x - 3)(x + 5)$   | 16 $2(x^2 + 3)(x^2 + 4)$ |
| 17 $(x + 2)(x - 2)$    | 18 $(x + 7)(x - 7)$      |
| 19 $(2x + 5)(2x - 5)$  | 20 $(3x + 5y)(3x - 5y)$  |
| 21 $4(3x + 1)(3x - 1)$ | 22 $2(x + 5)(x - 5)$     |
| 23 $2(3x - 2)(x - 1)$  | 24 $3(5x - 1)(x + 3)$    |

## Exercise 1F

- |                        |                    |                 |                   |
|------------------------|--------------------|-----------------|-------------------|
| 1 a $x^5$              | b $x^{-2}$         | c $x^4$         |                   |
| d $x^3$                | e $x^5$            | f $12x^0 = 12$  |                   |
| g $3x^{\frac{1}{2}}$   | h $5x$             | i $6x^{-1}$     |                   |
| 2 a $\pm 5$            | b $\pm 9$          | c 3             | d $\frac{1}{16}$  |
| e $\pm \frac{1}{3}$    | f $-\frac{1}{125}$ | g 1             | h $\pm 6$         |
| i $\pm \frac{125}{64}$ | j $\frac{9}{4}$    | k $\frac{5}{6}$ | l $\frac{64}{49}$ |

## Exercise 1G

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| 1 $2\sqrt{7}$   | 2 $6\sqrt{2}$   | 3 $5\sqrt{2}$   |
| 4 $4\sqrt{2}$   | 5 $3\sqrt{10}$  | 6 $\sqrt{3}$    |
| 7 $\sqrt{3}$    | 8 $6\sqrt{5}$   | 9 $7\sqrt{2}$   |
| 10 $12\sqrt{7}$ | 11 $-3\sqrt{7}$ | 12 $9\sqrt{5}$  |
| 13 $23\sqrt{5}$ | 14 2            | 15 $19\sqrt{3}$ |

## Exercise 1H

- |                                    |  |
|------------------------------------|--|
| 1 $\frac{\sqrt{5}}{5}$             | 2 $\frac{\sqrt{11}}{11}$                     |
| 3 $\frac{\sqrt{2}}{2}$             | 4 $\frac{\sqrt{5}}{5}$                       |
| 5 $\frac{1}{2}$                    | 6 $\frac{1}{4}$                              |
| 7 $\frac{\sqrt{13}}{13}$           | 8 $\frac{1}{3}$                              |
| 9 $\frac{1 - \sqrt{3}}{-2}$        | 10 $\frac{2 - \sqrt{5}}{-1}$                 |
| 11 $\frac{3 + \sqrt{7}}{2}$        | 12 $3 + \sqrt{5}$                            |
| 13 $\frac{\sqrt{5} + \sqrt{3}}{2}$ | 14 $\frac{(3 - \sqrt{2})(4 + \sqrt{5})}{11}$ |
| 15 $\frac{5(2 - \sqrt{5})}{-1}$    | 16 $5(4 + \sqrt{14})$                        |
| 17 $\frac{11(3 - \sqrt{11})}{-2}$  | 18 $\frac{5 - \sqrt{21}}{-2}$                |
| 19 $\frac{14 - \sqrt{187}}{3}$     | 20 $\frac{35 + \sqrt{1189}}{6}$              |
| 21 -1                              |  |

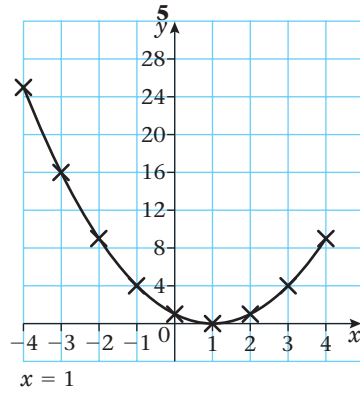
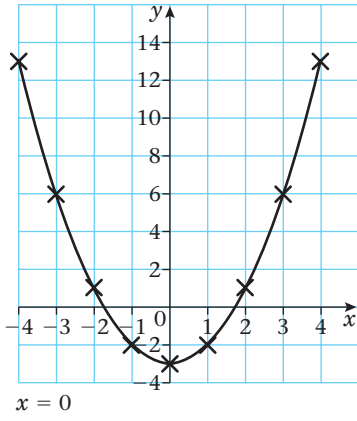
## Mixed exercise 1I

- |                          |                       |                                |                                 |
|--------------------------|-----------------------|--------------------------------|---------------------------------|
| 1 a $y^8$                | b $6x^7$              | c $32x$                        | d $12b^9$                       |
| 2 a $15y + 12$           | c $16x^2 + 13x$       | b $15x^2 - 25x^3 + 10x^4$      | d $9x^3 - 3x^2 + 4x$            |
| 3 a $x(3x + 4)$          | c $x(x + y + y^2)$    | b $2y(2y + 5)$                 | d $2xy(4y + 5x)$                |
| 4 a $(x + 1)(x + 2)$     | c $(x - 7)(x + 5)$    | b $3x(x + 2)$                  | d $(2x - 3)(x + 1)$             |
| e $(5x + 2)(x - 3)$      | 5 a $3x^6$            | b $\pm 2$                      | f $(1 - x)(6 + x)$              |
| 6 a $\frac{4}{9}$        | b $\frac{3375}{4913}$ | c $6x^2$                       | d $\frac{1}{2}x^{-\frac{1}{3}}$ |
| 7 a $\frac{\sqrt{7}}{7}$ | b $4\sqrt{5}$         |                                |                                 |
| 8 a $\frac{\sqrt{3}}{3}$ |                       | b $\sqrt{2} + 1$               |                                 |
| c $-3\sqrt{3} - 6$       |                       | d $\frac{30 - \sqrt{851}}{-7}$ |                                 |

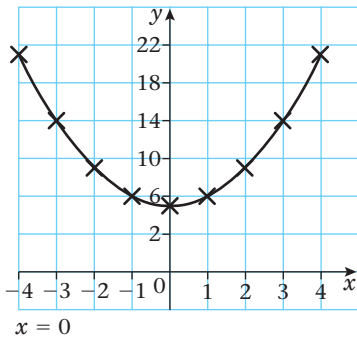
# Chapter 2 Answers

## Exercise 2A

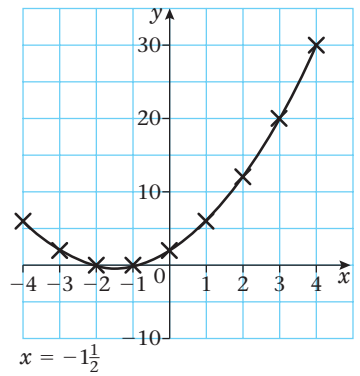
1



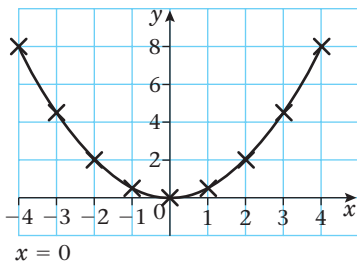
2



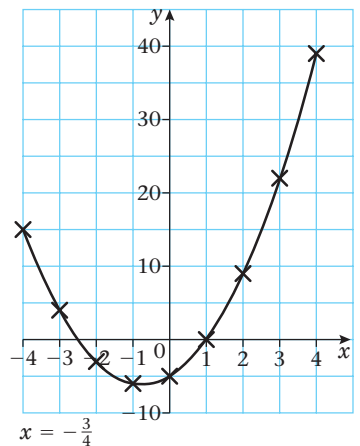
6



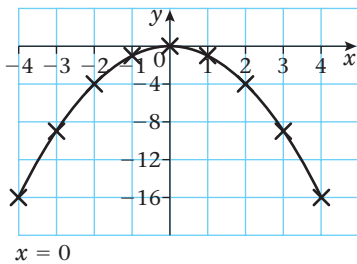
3



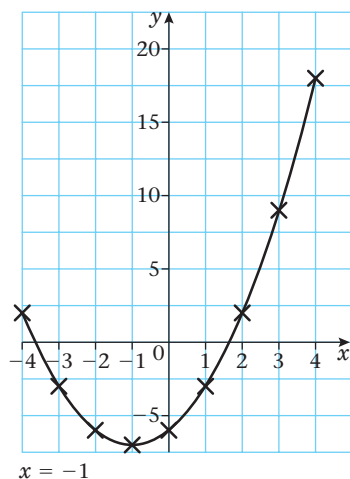
7



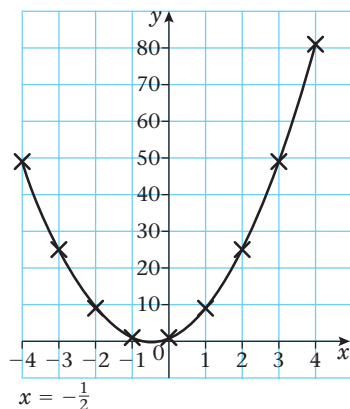
4



8



9



## Exercise 2B

- |  |  |
|--|--|
| 1 $x = 0$ or $x = 4$                       | 2 $x = 0$ or $x = 25$                      |
| 3 $x = 0$ or $x = 2$                       | 4 $x = 0$ or $x = 6$                       |
| 5 $x = -1$ or $x = -2$                     | 6 $x = -1$ or $x = -4$                     |
| 7 $x = -5$ or $x = -2$                     | 8 $x = 3$ or $x = -2$                      |
| 9 $x = 3$ or $x = 5$                       | 10 $x = 4$ or $x = 5$                      |
| 11 $x = 6$ or $x = -1$                     | 12 $x = 6$ or $x = -2$                     |
| 13 $x = -\frac{1}{2}$ or $x = -3$          | 14 $x = -\frac{1}{3}$ or $x = \frac{3}{2}$ |
| 15 $x = -\frac{2}{3}$ or $x = \frac{3}{2}$ | 16 $x = \frac{3}{2}$ or $x = \frac{5}{2}$  |
| 17 $x = \frac{1}{3}$ or $x = -2$           | 18 $x = 3$ or $x = 0$                      |
| 19 $x = 13$ or $x = 1$                     | 20 $x = 2$ or $x = -2$                     |
| 21 $x = \pm\sqrt{\frac{5}{3}}$             | 22 $x = 3 \pm \sqrt{13}$                   |
| 23 $x = \frac{1 \pm \sqrt{11}}{3}$         | 24 $x = 1$ or $x = -\frac{7}{6}$           |
| 25 $x = -\frac{1}{2}$ or $x = \frac{7}{3}$ | 26 $x = 0$ or $x = -\frac{11}{6}$          |

## Exercise 2C

- |  |  |
|--|--|
| 1 $(x + 2)^2 - 4$                        | 2 $(x - 3)^2 - 9$                        |
| 3 $(x - 8)^2 - 64$                       | 4 $(x + \frac{1}{2})^2 - \frac{1}{4}$    |
| 5 $(x - 7)^2 - 49$                       | 6 $2(x + 4)^2 - 32$                      |
| 7 $3(x - 4)^2 - 48$                      | 8 $2(x - 1)^2 - 2$                       |
| 9 $5(x + 2)^2 - 20$                      | 10 $2(x - \frac{5}{4})^2 - \frac{25}{8}$ |
| 11 $3(x + \frac{3}{2})^2 - \frac{27}{4}$ | 12 $3(x - \frac{1}{6})^2 - \frac{1}{12}$ |

## Exercise 2D

- |                          |                          |
|--------------------------|--------------------------|
| 1 $x = -3 \pm 2\sqrt{2}$ | 2 $x = -6 \pm \sqrt{33}$ |
| 3 $x = 5 \pm \sqrt{30}$  | 4 $x = -2 \pm \sqrt{6}$  |

5  $x = \frac{3}{2} \pm \frac{\sqrt{29}}{2}$

6  $x = 1 \pm \frac{3}{2}\sqrt{2}$

7  $x = \frac{1}{8} \pm \frac{\sqrt{129}}{8}$

8 No real roots

9  $x = -\frac{3}{2} \pm \frac{\sqrt{39}}{2}$

10  $x = -\frac{4}{5} \pm \frac{\sqrt{26}}{5}$

## Exercise 2E

1  $\frac{-3 \pm \sqrt{5}}{2}$ , -0.38 or -2.62

2  $\frac{+3 \pm \sqrt{17}}{2}$ , -0.56 or 3.56

3  $-3 \pm \sqrt{3}$ , -1.27 or -4.73

4  $\frac{5 \pm \sqrt{33}}{2}$ , 5.37 or -0.37

5  $\frac{-5 \pm \sqrt{31}}{3}$ , -3.52 or 0.19

6  $\frac{1 \pm \sqrt{2}}{2}$ , 1.21 or -0.21

7  $\frac{-9 \pm \sqrt{53}}{14}$ , -0.12 or -1.16

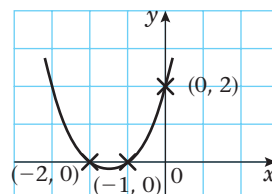
8  $\frac{-2 \pm \sqrt{19}}{5}$ , 0.47 or -1.27

9 2 or  $-\frac{1}{4}$

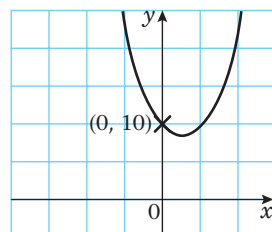
10  $\frac{-1 \pm \sqrt{78}}{11}$ , 0.71 or -0.89

## Exercise 2F

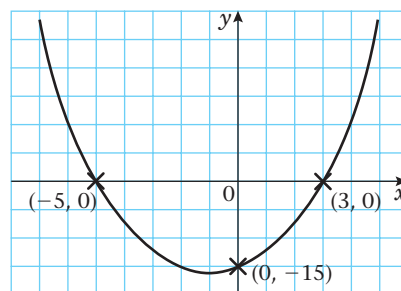
1 a

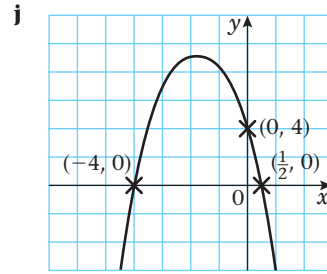
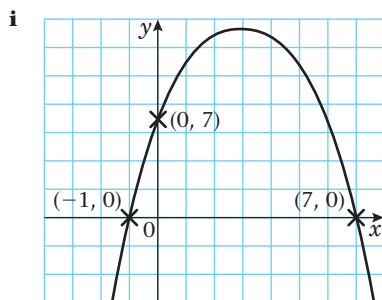
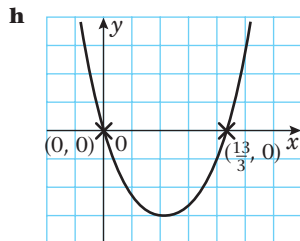
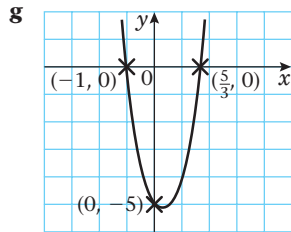
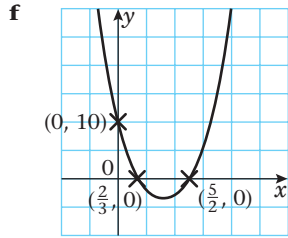
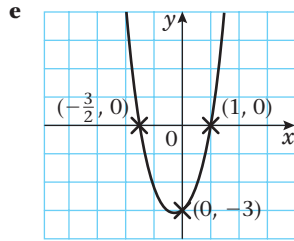
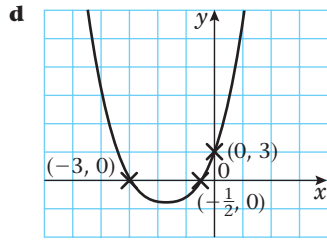


b



c



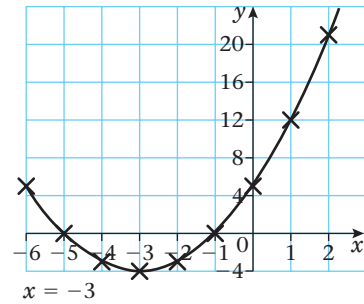


**2**  $\pm 4$

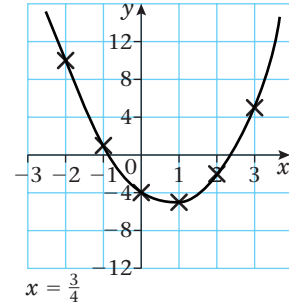
**3**  $\pm 4$

**Mixed exercise 2G**

**1 a**



**b**



**2 a**  $y = -1$  or  $-2$

**b**  $x = \frac{2}{3}$  or  $-5$

**c**  $x = -\frac{1}{3}$  or  $3$

**d**  $\frac{5 \pm \sqrt{7}}{2}$

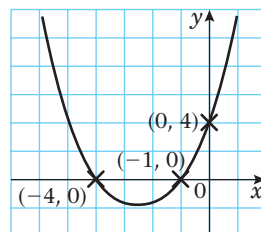
**3 a**  $\frac{-5 \pm \sqrt{17}}{2}$ ,  $-0.44$  or  $-4.56$

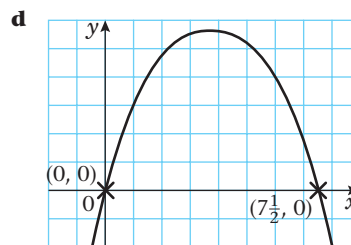
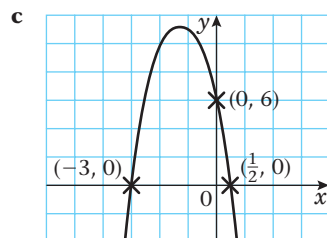
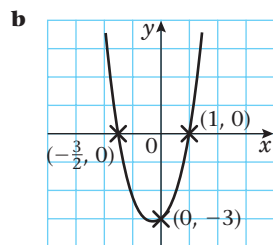
**b**  $2 \pm \sqrt{7}$ ,  $4.65$  or  $-0.65$

**c**  $\frac{-3 \pm \sqrt{29}}{10}$ ,  $0.24$  or  $-0.84$

**d**  $\frac{5 \pm \sqrt{73}}{6}$ ,  $2.25$  or  $-0.59$

**4 a**





**5 a**  $p = 3, q = 2, r = -7$

**b**  $-2 \pm \sqrt{\frac{7}{3}}$

**6**  $1 \pm \sqrt{13}$

**7**  $x = -5$  or  $x = 4$

# Chapter 3 Answers

## Exercise 3A

- 1  $x = 4, y = 2$                       2  $x = 1, y = 3$   
 3  $x = 2, y = -2$                     4  $x = 4\frac{1}{2}, y = -3$   
 5  $x = -\frac{2}{3}, y = 2$                     6  $x = 3, y = 3$

## Exercise 3B

- 1  $x = 5, y = 2$                       2  $x = 5\frac{1}{2}, y = -6$   
 3  $x = 1, y = -4$                     4  $x = 1\frac{3}{4}, y = \frac{1}{4}$

## Exercise 3C

- 1 **a**  $x = 5, y = 6$  or  $x = 6, y = 5$   
**b**  $x = 0, y = 1$  or  $x = \frac{4}{5}, y = -\frac{3}{5}$   
**c**  $x = -1, y = -3$  or  $x = 1, y = 3$   
**d**  $x = 4\frac{1}{2}, y = 4\frac{1}{2}$  or  $x = 6, y = 3$   
**e**  $a = 1, b = 5$  or  $a = 3, b = -1$   
**f**  $u = 1\frac{1}{2}, v = 4$  or  $u = 2, v = 3$   
 2  $(-11, -15)$  and  $(3, -1)$   
 3  $(-1\frac{1}{6}, -4\frac{1}{2})$  and  $(2, 5)$   
 4 **a**  $x = -1\frac{1}{2}, y = 5\frac{3}{4}$  or  $x = 3, y = -1$   
**b**  $x = 3, y = \frac{1}{2}$  or  $x = 6\frac{1}{3}, y = -2\frac{5}{6}$   
 5 **a**  $x = 3 + \sqrt{13}, y = -3 + \sqrt{13}$  or  $x = 3 - \sqrt{13},$   
 $y = -3 - \sqrt{13}$   
**b**  $x = 2 - 3\sqrt{5}, y = 3 + 2\sqrt{5}$  or  $x = 2 + 3\sqrt{5},$   
 $y = 3 - 2\sqrt{5}$

## Exercise 3D

- 1 **a**  $x < 4$                       **b**  $x \geq 7$                       **c**  $x > 2\frac{1}{2}$   
**d**  $x \leq -3$                     **e**  $x < 11$                     **f**  $x < 2\frac{3}{5}$   
**g**  $x > -12$                    **h**  $x < 1$                       **i**  $x \leq 8$   
**j**  $x > 1\frac{1}{7}$   
 2 **a**  $x \geq 3$                     **b**  $x < 1$                       **c**  $x \leq -3\frac{1}{4}$   
**d**  $x < 18$                     **e**  $x > 3$                       **f**  $x \geq 4\frac{2}{5}$   
**g**  $x < 4$                       **h**  $x > -7$                     **i**  $x \leq -\frac{1}{2}$   
**j**  $x \geq \frac{3}{4}$   
 3 **a**  $x > 2\frac{1}{2}$                     **b**  $2 < x < 4$                    **c**  $2\frac{1}{2} < x < 3$   
**d** No values                   **e**  $x = 4$

## Exercise 3E

- 1 **a**  $3 < x < 8$                     **b**  $-4 < x < 3$   
**c**  $x < -2, x > 5$                **d**  $x \leq -4, x \geq -3$   
**e**  $-\frac{1}{2} < x < 7$                 **f**  $x < -2, x > 2\frac{1}{2}$   
**g**  $\frac{1}{2} \leq x \leq 1\frac{1}{2}$                 **h**  $x < \frac{1}{3}, x > 2$   
**i**  $-3 < x < 3$                    **j**  $x < -2\frac{1}{2}, x > \frac{2}{3}$   
**k**  $x < 0, x > 5$                 **l**  $-1\frac{1}{2} \leq x \leq 0$   
 2 **a**  $-5 < x < 2$                 **b**  $x < -1, x > 1$   
**c**  $\frac{1}{2} < x < 1$                    **d**  $-3 < x < \frac{1}{4}$   
 3 **a**  $2 < x < 4$                    **b**  $x > 3$   
**c**  $-\frac{1}{4} < x < 0$                 **d** No values  
**e**  $-5 < x < -3, x > 4$        **f**  $-1 < x < 1, 2 < x < 3$   
 4 **a**  $-2 < k < 6$                 **b**  $-8 < p < 0$

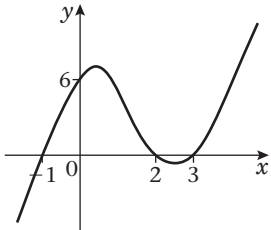
## Mixed exercise 3F

- 1  $x = -4, y = 3\frac{1}{2}$   
 2  $(3, 1)$  and  $(-2\frac{1}{5}, -1\frac{3}{5})$   
 3 **b**  $x = 4, y = 3$  and  $x = -2\frac{2}{3}, y = -\frac{1}{3}$   
 4  $x = -1\frac{1}{2}, y = 2\frac{1}{4}$  and  $x = 4, y = -\frac{1}{2}$   
 5 **a**  $x > 10\frac{1}{2}$                       **b**  $x < -2, x > 7$   
 6  $3 < x < 4$   
 7 **a**  $x = -5, x = 4$                **b**  $x < -5, x > 4$   
 8 **a**  $x < 2\frac{1}{2}$   
**b**  $\frac{1}{2} < x < 5$   
**c**  $\frac{1}{2} < x < 2\frac{1}{2}$   
 9  $k \leq 3\frac{1}{5}$   
 10  $x < 0, x > 1$   
 11 **a**  $1 \pm \sqrt{13}$                     **b**  $x < 1 - \sqrt{13}, x > 1 + \sqrt{13}$   
 12 **a**  $x < -4, x > 9$                **b**  $y < -3, y > 3$   
 13 **a**  $2x + 2(x - 5) > 32$        **b**  $x(x - 5) < 104$   
**c**  $10\frac{1}{2} < x < 13$

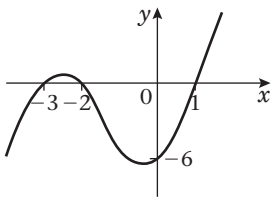
# Chapter 4 Answers

## Exercise 4A

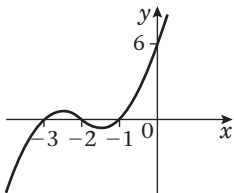
1 a



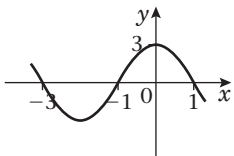
b



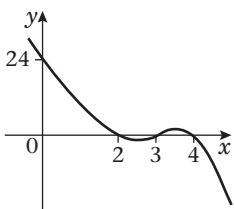
c



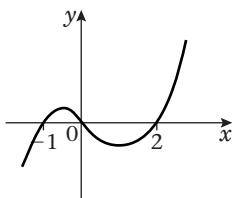
d



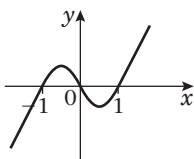
e



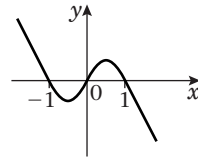
f



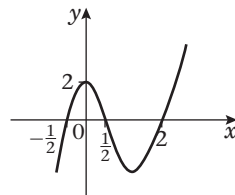
g



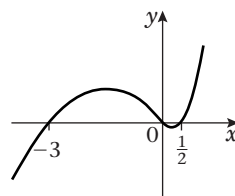
h



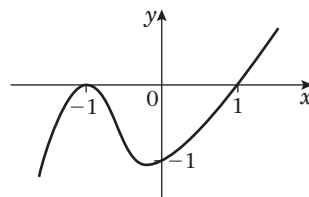
i



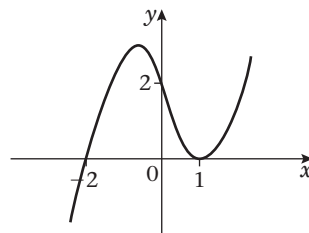
j



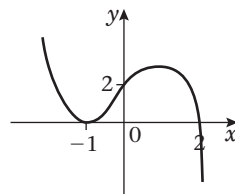
2 a



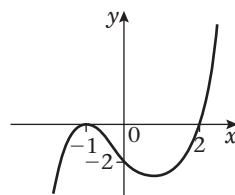
b

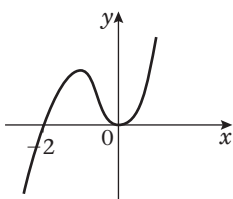
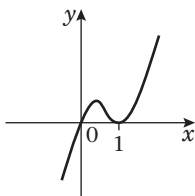
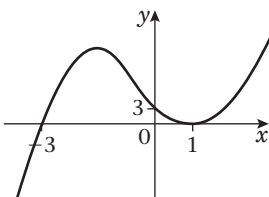
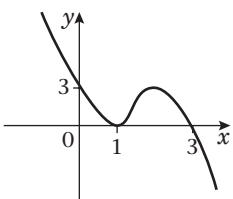
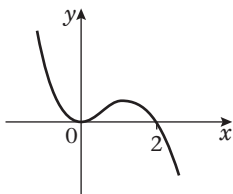
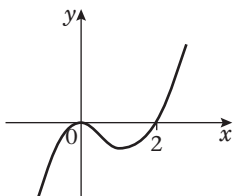


c

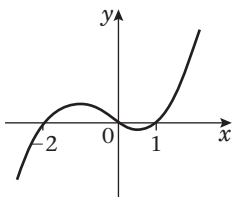


d

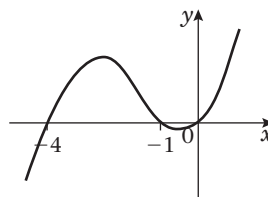


**e****f****g****h****i****j**

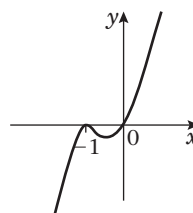
**3 a**  $y = x(x + 2)(x - 1)$



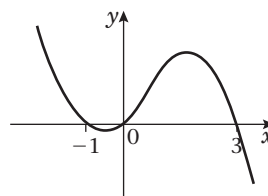
**b**  $y = x(x + 4)(x + 1)$



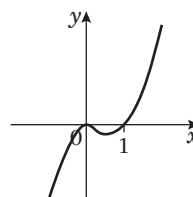
**c**  $y = x(x + 1)^2$



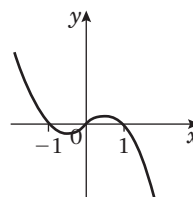
**d**  $y = x(x + 1)(3 - x)$



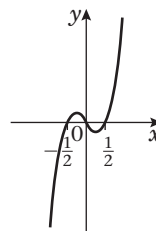
**e**  $y = x^2(x - 1)$



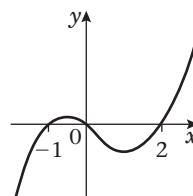
**f**  $y = x(1 - x)(1 + x)$



**g**  $y = 3x(2x - 1)(2x + 1)$

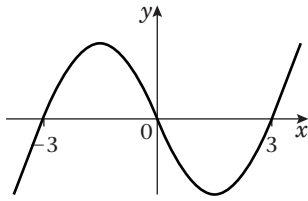


**h**  $y = x(x + 1)(x - 2)$

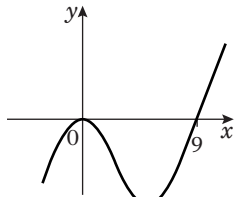




**i**  $y = x(x - 3)(x + 3)$

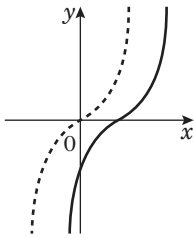


**j**  $y = x^2(x - 9)$

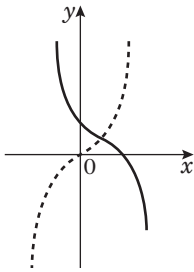


### Exercise 4B

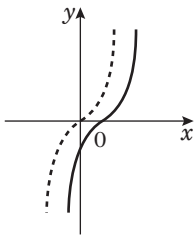
**1 a**



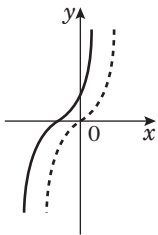
**b**



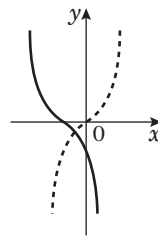
**c**



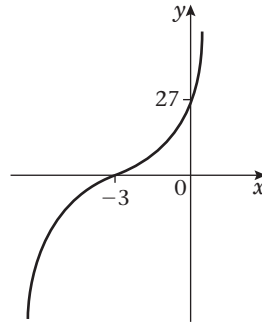
**d**



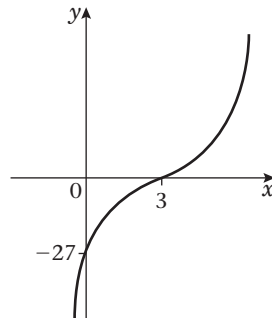
**e**



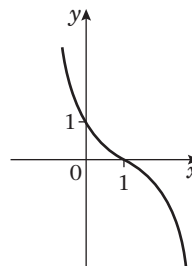
**2 a**



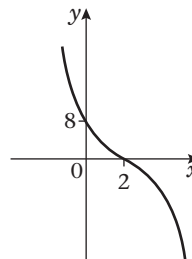
**b**



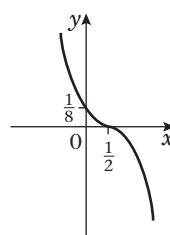
**c**



**d**

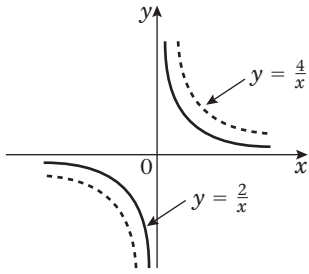


**e**

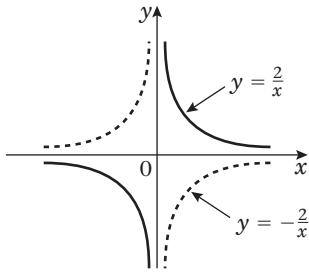


Exercise 4C

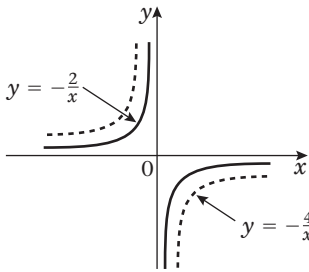
1



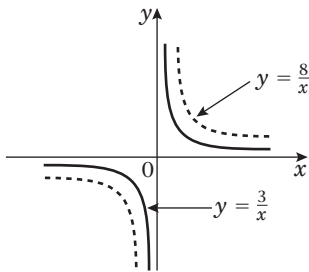
2



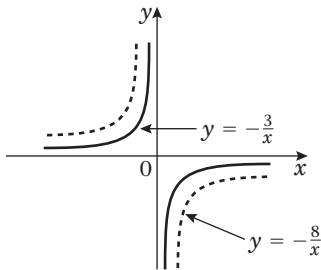
3



4

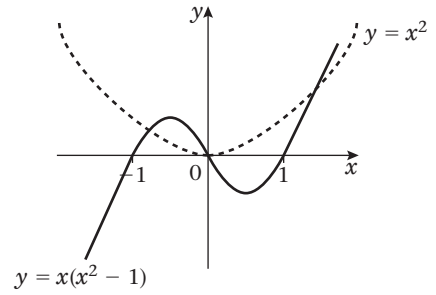


5



Exercise 4D

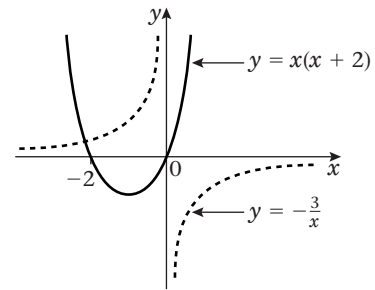
1 a i



ii 3

iii  $x^2 = x(x^2 - 1)$

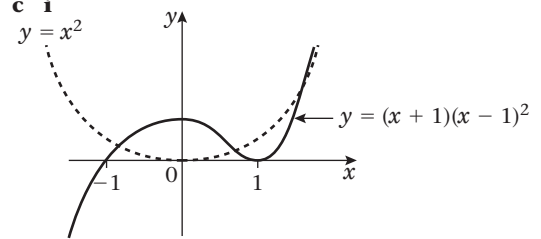
b i



ii 1

iii  $x(x + 2) = -\frac{3}{x}$

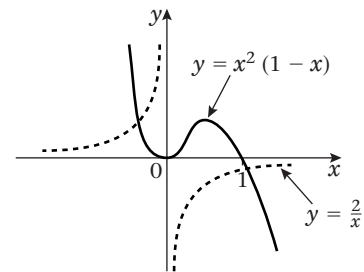
c i



ii 3

iii  $x^2 = (x + 1)(x - 1)^2$

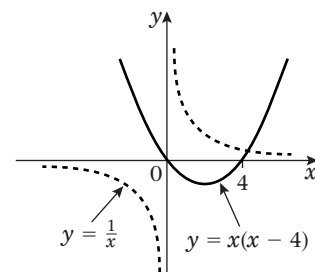
d i



ii 2

iii  $x^2(1 - x) = \frac{2}{x}$

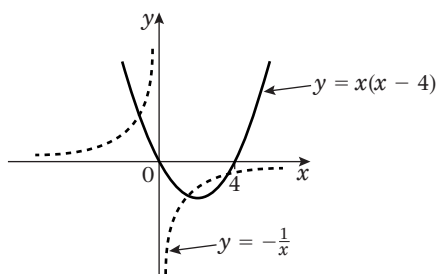
e i



ii 1

iii  $x(x - 4) = \frac{1}{x}$

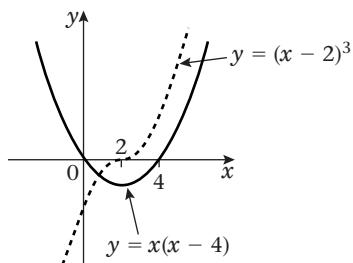
f i



ii 3

$$\text{iii } x(x-4) = -\frac{1}{x}$$

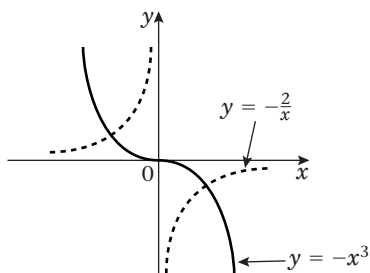
g i



ii 1

$$\text{iii } x(x-4) = (x-2)^3$$

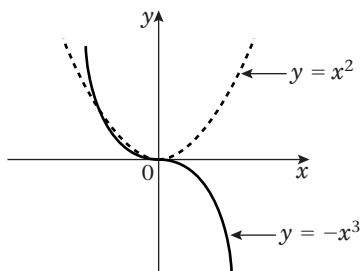
h i



ii 2

$$\text{iii } -x^3 = -\frac{2}{x}$$

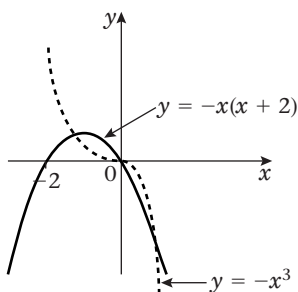
i i



ii 2

$$\text{iii } -x^3 = x^2$$

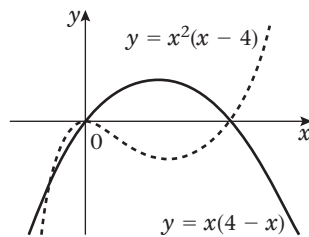
j i



ii 3

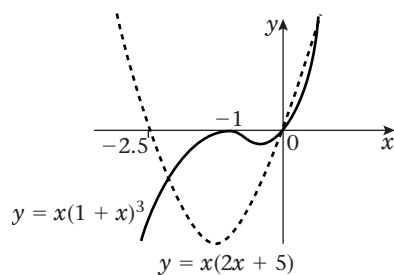
$$\text{iii } -x^3 = -x(x+2)$$

2 a



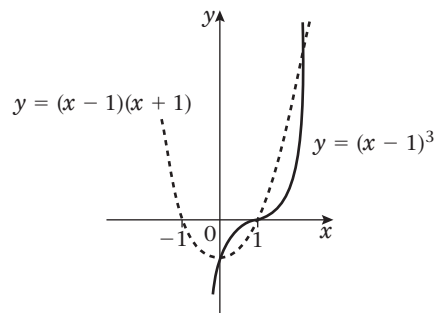
b (0, 0); (4, 0); (-1, -5)

3 a



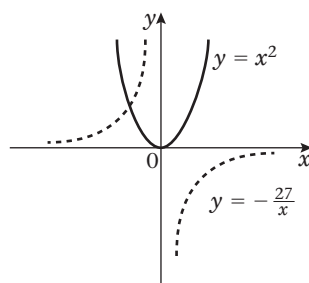
b (0, 0); (2, 18); (-2, -2)

4 a



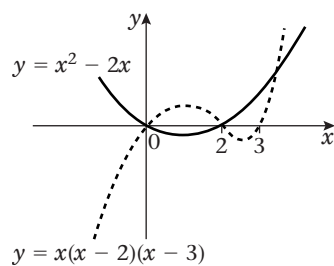
b (0, -1); (1, 0); (3, 8)

5 a



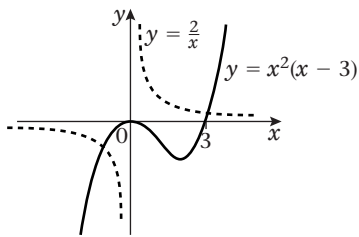
b (-3, 9)

6 a



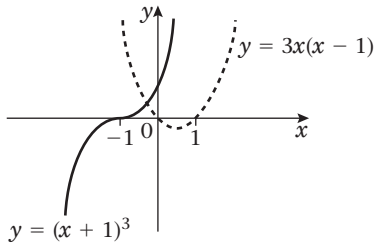
b (0, 0); (2, 0); (4, 8)

7 a



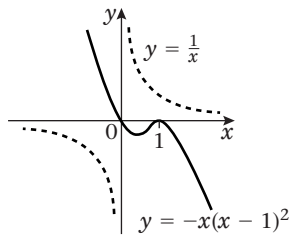
b Only 2 intersections

8 a



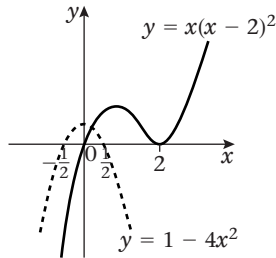
b Only 1 intersection

9 a



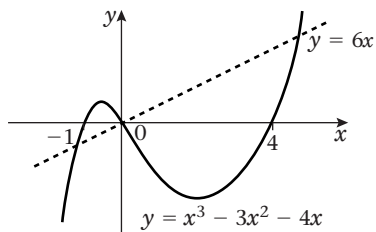
b Graphs do not intersect.

10 a



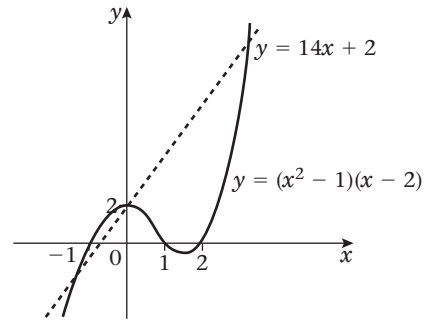
b 1, since graphs only cross once

11 a



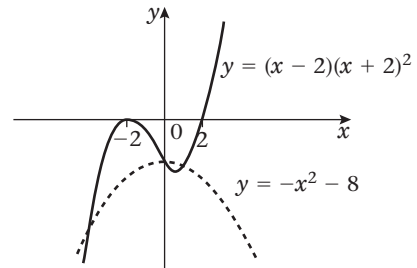
b (0, 0); (-2, -12); (5, 30)

12 a



b (0, 2); (-3, -40); (5, 72)

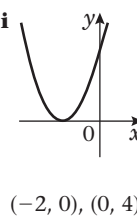
13 a



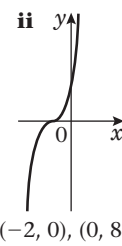
b (0, -8); (1, -9); (-4, -24)

Exercise 4E

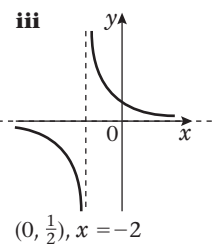
1 a i



(-2, 0), (0, 4)

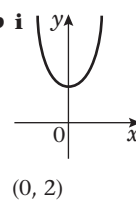


(-2, 0), (0, 8)

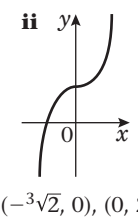


(0, 1/2), x = -2

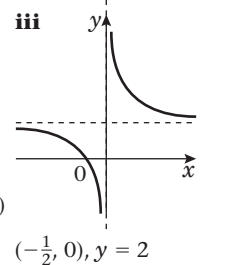
b i



(0, 2)

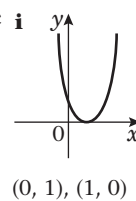


(-3√2, 0), (0, 2)

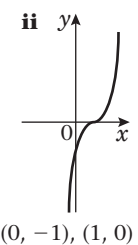


(-1/2, 0), y = 2

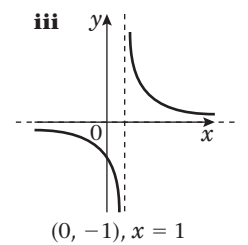
c i



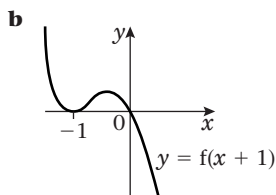
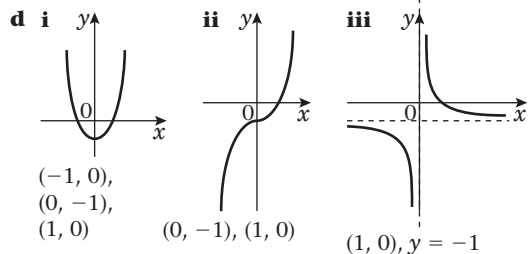
(0, 1), (1, 0)



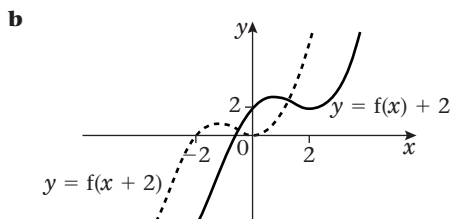
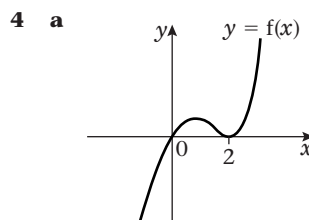
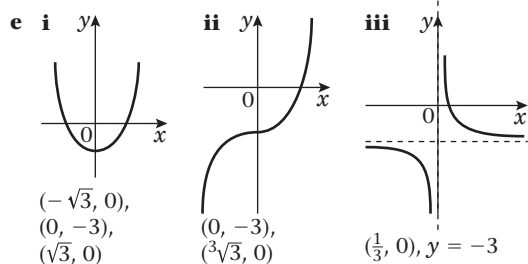
(0, -1), (1, 0)



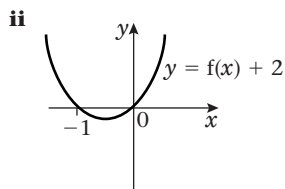
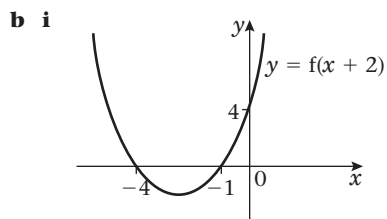
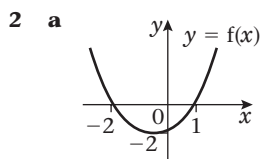
(0, -1), x = 1



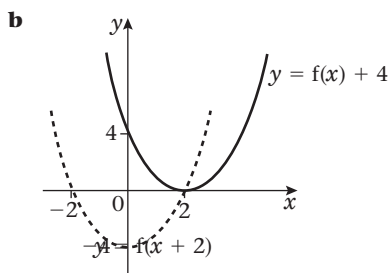
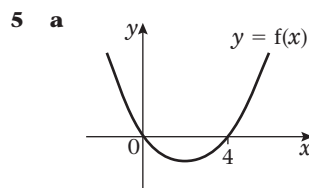
**c**  $f(x + 1) = -x(x + 1)^2; (0, 0)$



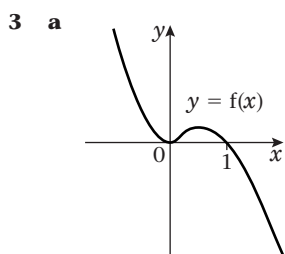
**c**  $f(x + 2) = (x + 2)x^2; (0, 0); (-2, 0)$



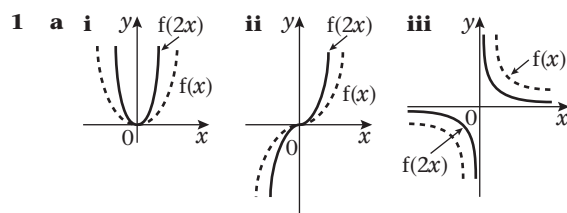
**c**  $f(x + 2) = (x + 1)(x + 4); (0, 4)$   
 $f(x) + 2 = (x - 1)(x + 2) + 2; (0, 0)$

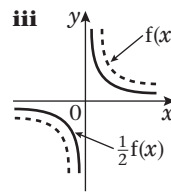
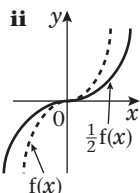
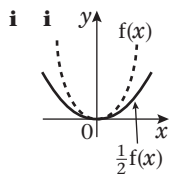
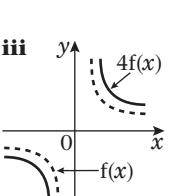
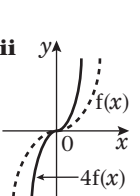
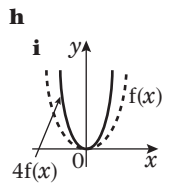
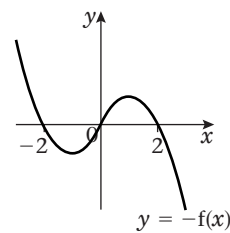
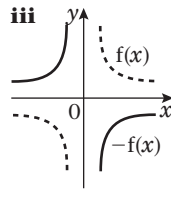
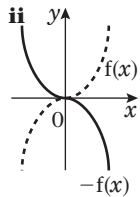
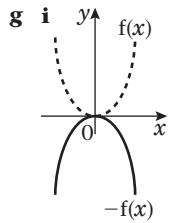
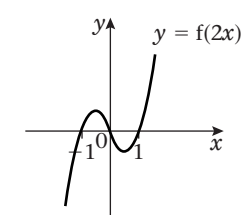
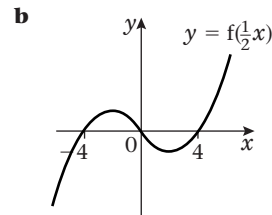
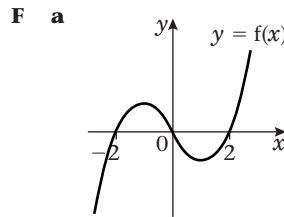
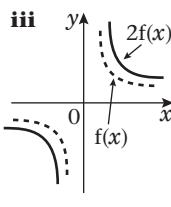
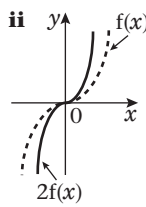
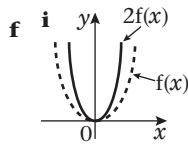
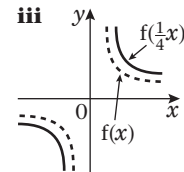
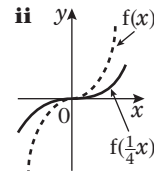
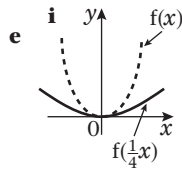
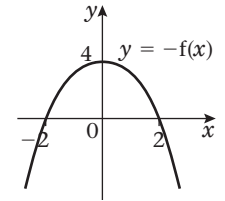
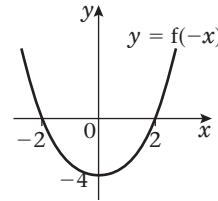
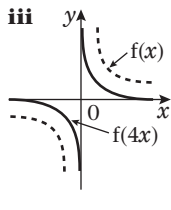
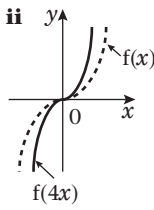
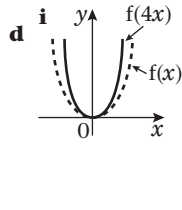
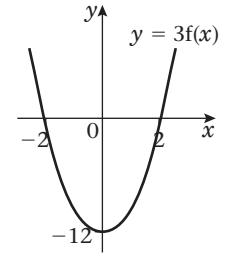
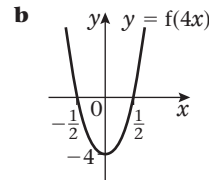
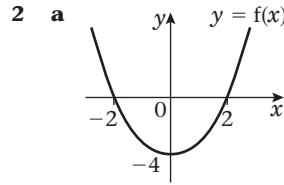
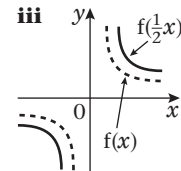
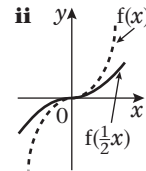
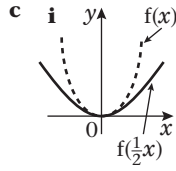
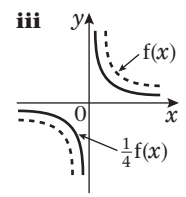
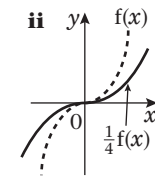
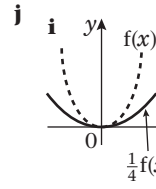
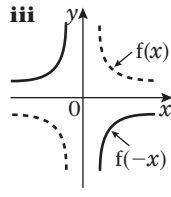
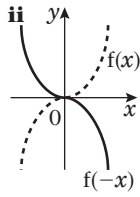
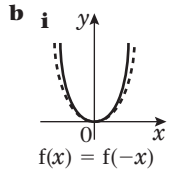


**c**  $f(x + 2) = (x + 2)(x - 2); (2, 0); (-2, 0)$   
 $f(x) + 4 = (x - 2)^2; (2, 0)$

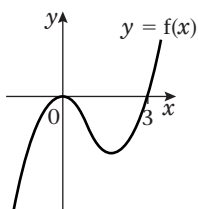


**Exercise 4F**

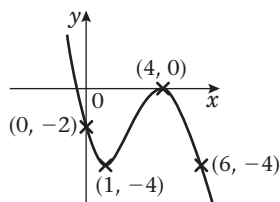




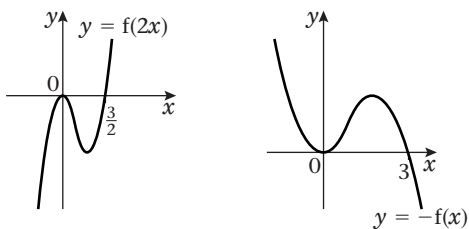
4 a



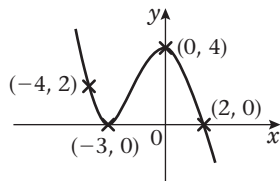
b



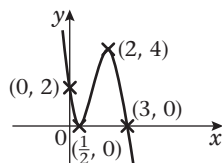
b



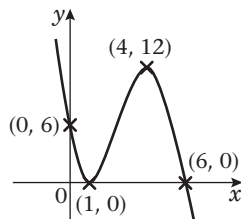
c



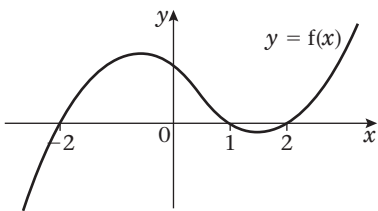
d



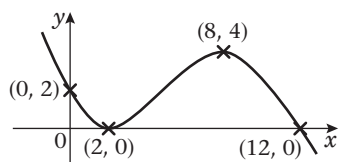
e



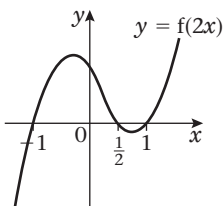
5 a



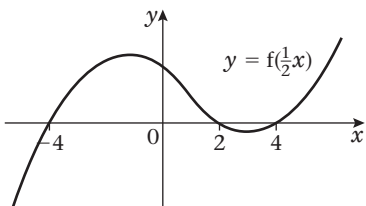
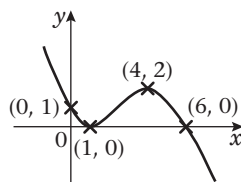
f



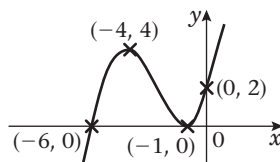
b



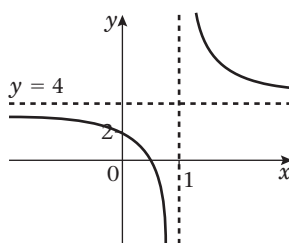
g



h

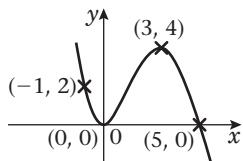


2 a  $y = 4, x = 1, (0, 2)$

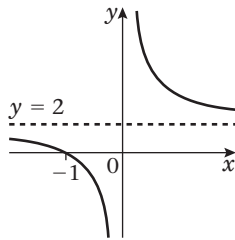


Exercise 4G

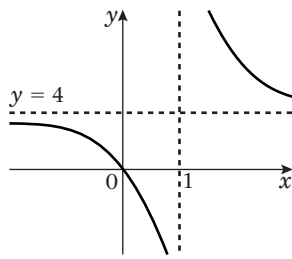
1 a



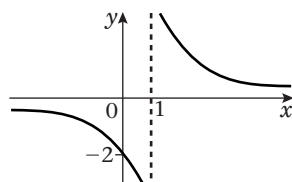
**b**  $y = 2, x = 0, (-1, 0)$



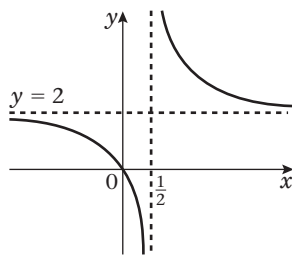
**c**  $y = 4, x = 1, (0, 0)$



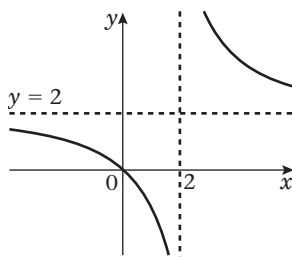
**d**  $y = 0, x = 1, (0, -2)$



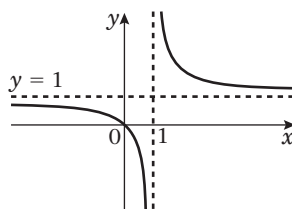
**e**  $y = 2, x = \frac{1}{2}, (0, 0)$



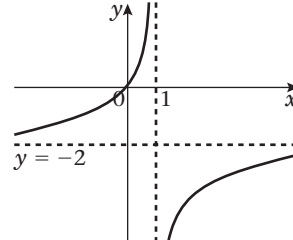
**f**  $y = 2, x = 2, (0, 0)$



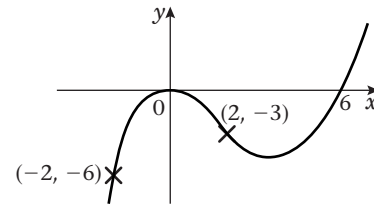
**g**  $y = 1, x = 1, (0, 0)$



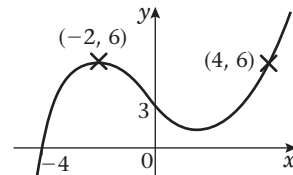
**h**  $y = -2, x = 1, (0, 0)$



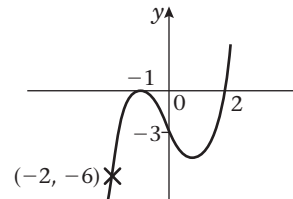
**3 a**  $A(-2, -6), B(0, 0), C(2, -3), D(6, 0)$



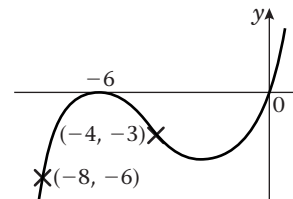
**b**  $A(-4, 0), B(-2, 6), C(0, 3), D(4, 6)$



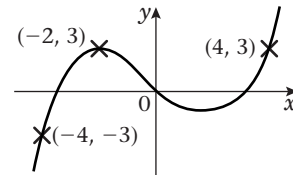
**c**  $A(-2, -6), B(-1, 0), C(0, -3), D(2, 0)$



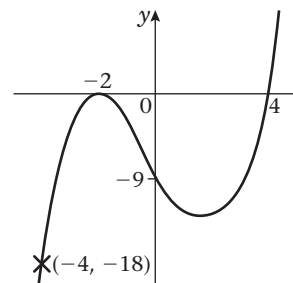
**d**  $A(-8, -6), B(-6, 0), C(-4, -3), D(0, 0)$



**e**  $A(-4, -3), B(-2, 3), C(0, 0), D(4, 3)$

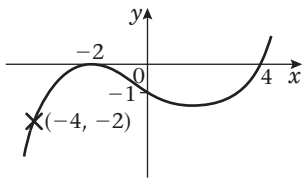


**f**  $A(-4, -18), B(-2, 0), C(0, -9), D(4, 0)$

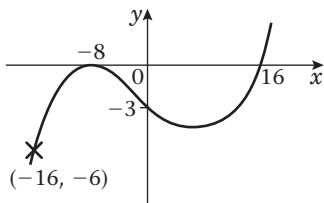




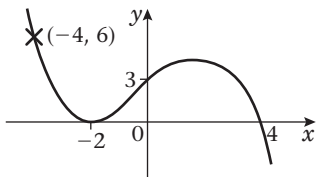
**g** A(-4, -2), B(-2, 0), C(0, -1), D(4, 0)



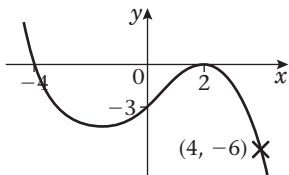
**h** A(-16, -6), B(-8, 0), C(0, -3), D(16, 0)



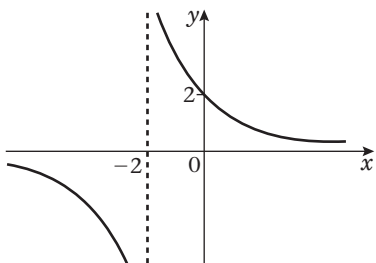
**i** A(-4, 6), B(-2, 0), C(0, 3), D(4, 0)



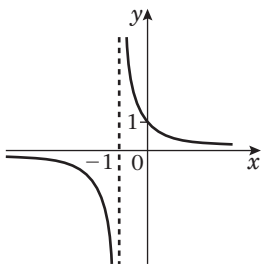
**j** A(4, -6), B(2, 0), C(0, -3), D(-4, 0)



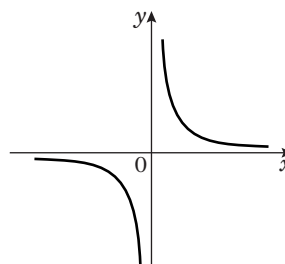
**4 a i**  $x = -2, y = 0, (0, 2)$



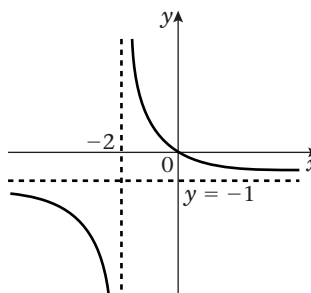
**ii**  $x = -1, y = 0, (0, 1)$



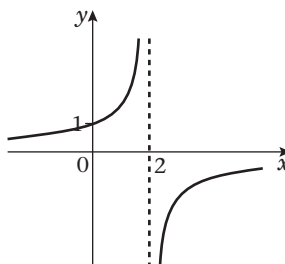
**iii**  $x = 0, y = 0$



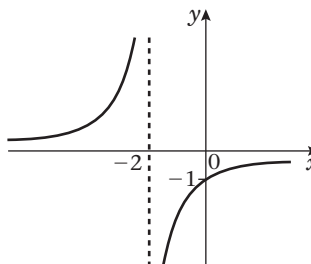
**iv**  $x = -2, y = -1, (0, 0)$



**v**  $x = 2, y = 0, (0, 1)$



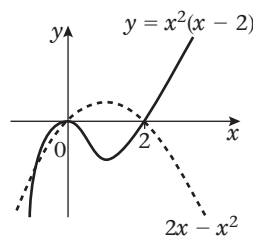
**vi**  $x = -2, y = 0, (0, -1)$



**b**  $f(x) = \frac{2}{x+2}$

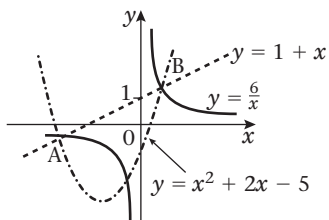
**Mixed exercise 4H**

**1 a**



**b**  $x = 0, -1, 2$ ; points (0, 0), (2, 0), (-1, -3)

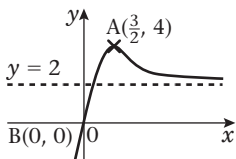
2 a



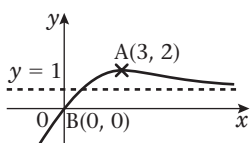
b  $A(-3, -2)$   $B(2, 3)$

c  $y = x^2 + 2x - 5$

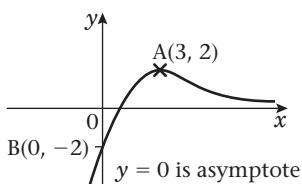
3 a



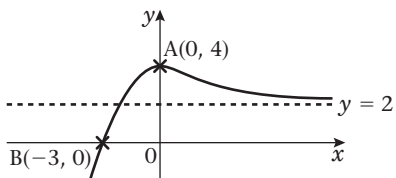
b



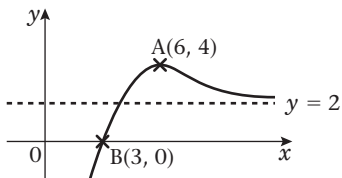
c



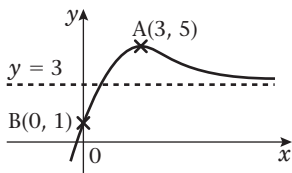
d



e

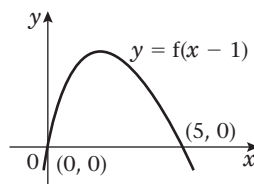


f

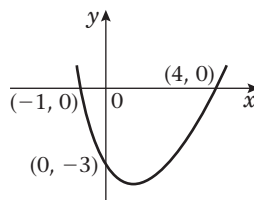


4 a  $x = -1$  at A,  $x = 3$  at B

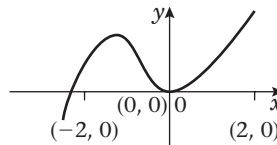
5 a



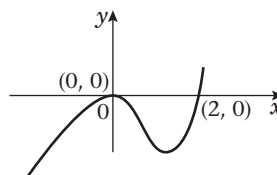
b



6 a

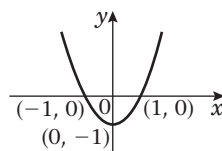


b

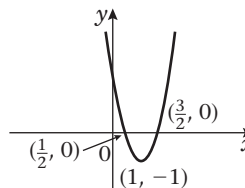


7 a  $f \geq -1$   $y = x^2 - 4x + 3$

b i

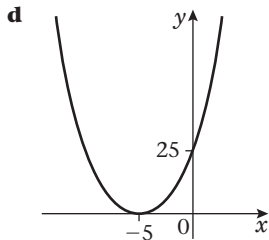


ii

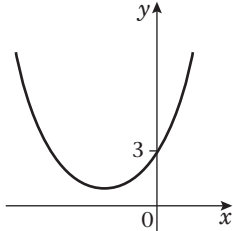


# Review Exercise 1 Answers

- 1 a**  $x(2x + 1)(x - 7)$   
**b**  $(3x - 4)(3x + 4)$   
**c**  $(x + 1)(x - 1)(x^2 + 8)$
- 2 a** 9  
**b** 27  
**c**  $\frac{1}{27}$
- 3 a** 2  
**b**  $\frac{1}{4}$
- 4 a** 625  
**b**  $\frac{4}{3}x^{\frac{2}{3}}$
- 5 a**  $4\sqrt{5}$   
**b**  $21 - 8\sqrt{5}$
- 6 a** 13  
**b**  $8 - 2\sqrt{3}$
- 7 a**  $6\sqrt{3}$   
**b**  $7 - 4\sqrt{3}$
- 8 a**  $56\sqrt{7}$   
**b**  $10 - 13\sqrt{7}$   
**c**  $16 + 6\sqrt{7}$
- 9 a**  $x = -8$  or  $x = 9$   
**b**  $x = 0$  or  $x = -\frac{7}{2}$   
**c**  $x = -\frac{3}{2}$  or  $x = \frac{3}{5}$
- 10 a**  $x = -2.17$  or  $-7.83$   
**b**  $x = 2.69$  or  $x = -0.186$   
**c**  $x = 2.82$  or  $x = 0.177$
- 11 a**  $a = -4$ ,  $b = -45$   
**b**  $x = 4 \pm 3\sqrt{5}$
- 12 a**  $(x - 3)^2 + 9$   
**b** P is (0, 18), Q is (3, 9)  
**c**  $x = 3 + 4\sqrt{2}$
- 13**  $k = 6$ ,  $x = -1$  (same root)
- 14 a**  $a = 5$ ,  $b = 11$   
**b** discriminant  $< 0$  so no real roots  
**c**  $k = 25$



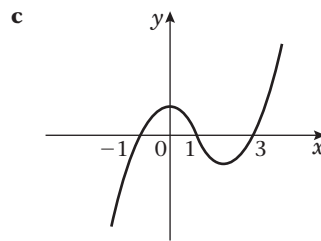
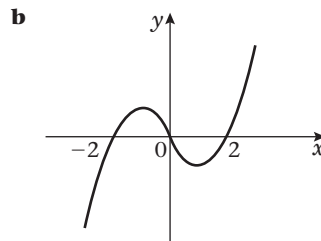
- 15 a**  $a = 1$ ,  $b = 2$   
**b**



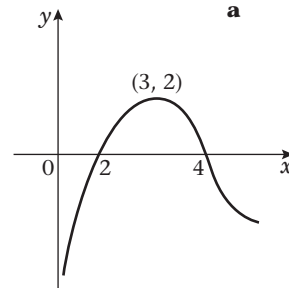
- c** discriminant =  $-8$   
**d**  $-2\sqrt{3} < k < 2\sqrt{3}$
- 16**  $y = 4$ ,  $x = -2$  or  $y = -2$ ,  $x = 4$
- 17 a**  $x^2 + 4x - 8 = 0$   
**b**  $x = -2 \pm 2\sqrt{3}$ ,  $y = -6 \pm 2\sqrt{3}$
- 18**  $x = 2$ ,  $y = -1$  or  $x = -\frac{1}{3}$ ,  $y = -\frac{17}{3}$
- 19 a**  $x > \frac{1}{4}$   
**b**  $x < \frac{1}{2}$  or  $x > 3$   
**c**  $\frac{1}{4} < x < \frac{1}{2}$  or  $x > 3$
- 20 a**  $0 < x < 6$   
**b**  $x < -4$  or  $x > \frac{5}{3}$
- 21 a**  $x = \frac{7}{2}$ ,  $y = -2$ ,  $x = -3$ ,  $y = 11$   
**b**  $x < -3$  or  $x > 3\frac{1}{2}$

- 22 a** Different real roots, determinant  $> 0$ , so  $k^2 - 4k - 12 > 0$   
**b**  $k < -2$  or  $k > 6$
- 23**  $0 < k < \frac{8}{9}$
- 24 a**  $p^2 - 8p - 20 > 0$   
**b**  $p < -2$  or  $p > 10$   
**c**  $x = \frac{-3 \pm \sqrt{13}}{2}$

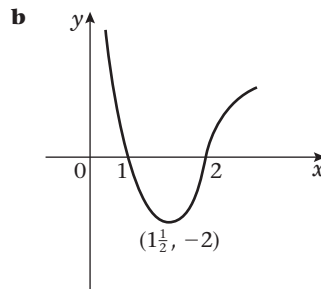
- 25 a**  $x(x - 2)(x + 2)$



**26**

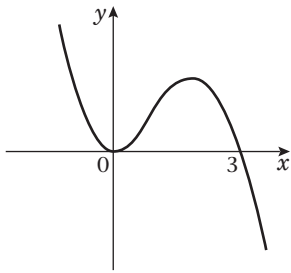


(2, 0) (4, 0) and (3, 2)

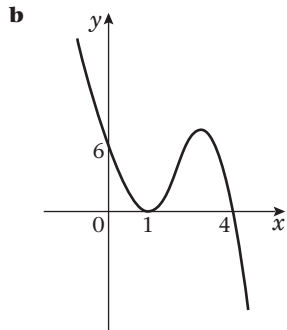


(1, 0) (2, 0) and  $(\frac{1}{2}, -2)$

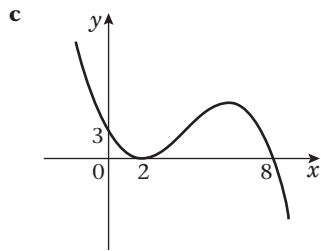
**27 a**



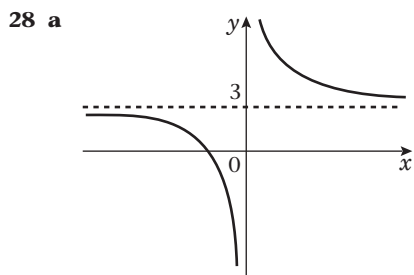
(0, 0) and (3, 0)



(1, 0) (4, 0) and (0, 6)



(2, 0) (8, 0) and (0, 3)

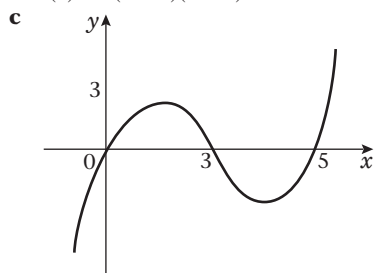


Asymptotes:  $y = 3$  and  $x = 0$

**b**  $(-\frac{1}{3}, 0)$

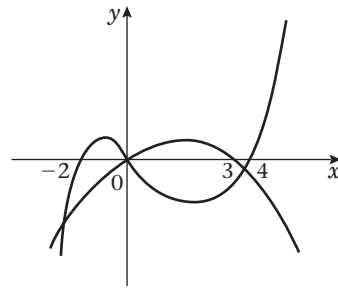
**29 a**  $f(x) = x(x^2 - 8x + 15)$

**b**  $f(x) = x(x - 3)(x - 5)$



(0, 0), (3, 0) and (5, 0)

**30 a**



(-2, 0), (0, 0) and (4, 0)  
(0, 0) and (3, 0)

**b** (0, 0),  
 $(\frac{1}{2}(1 + 3\sqrt{5}), -10 + 3\sqrt{5})$ ,  
 $(\frac{1}{2}(1 - 3\sqrt{5}), -10 - 3\sqrt{5})$

# Chapter 5 Answers

## Exercise 5A

- 1 a**  $-2$       **b**  $-1$       **c**  $3$       **d**  $\frac{1}{3}$   
**e**  $-\frac{2}{3}$       **f**  $\frac{5}{4}$       **g**  $\frac{1}{2}$       **h**  $2$   
**i**  $\frac{1}{2}$       **j**  $\frac{1}{2}$       **k**  $-2$       **l**  $-\frac{3}{2}$   
**2 a**  $4$       **b**  $-5$       **c**  $-\frac{2}{3}$       **d**  $0$   
**e**  $\frac{7}{5}$       **f**  $2$       **g**  $2$       **h**  $-2$   
**i**  $9$       **j**  $-3$       **k**  $\frac{3}{2}$       **l**  $-\frac{1}{2}$   
**3 a**  $4x - y + 3 = 0$       **b**  $3x - y - 2 = 0$   
**c**  $6x + y - 7 = 0$       **d**  $4x - 5y - 30 = 0$   
**e**  $5x - 3y + 6 = 0$       **f**  $7x - 3y = 0$   
**g**  $14x - 7y - 4 = 0$       **h**  $27x + 9y - 2 = 0$   
**i**  $18x + 3y + 2 = 0$       **j**  $2x + 6y - 3 = 0$   
**k**  $4x - 6y + 5 = 0$       **l**  $6x - 10y + 5 = 0$   
**4**  $y = 5x + 3$   
**5**  $2x + 5y + 20 = 0$   
**6**  $y = -\frac{1}{2}x + 7$   
**7**  $y = \frac{2}{3}x$   
**8**  $(3, 0)$   
**9**  $(\frac{5}{3}, 0)$   
**10**  $(0, 5), (-4, 0)$

## Exercise 5B

- 1 a**  $\frac{1}{2}$       **b**  $\frac{1}{6}$       **c**  $-\frac{3}{5}$       **d**  $2$   
**e**  $-1$       **f**  $\frac{1}{2}$       **g**  $\frac{1}{2}$       **h**  $8$   
**i**  $\frac{2}{3}$       **j**  $-4$       **k**  $-\frac{1}{3}$       **l**  $-\frac{1}{2}$   
**m**  $1$       **n**  $\frac{q^2 - p^2}{q - p} = q + p$   
**2**  $7$   
**3**  $12$   
**4**  $4\frac{1}{3}$   
**5**  $2\frac{1}{4}$   
**6**  $\frac{1}{4}$   
**7**  $26$   
**8**  $-5$

## Exercise 5C

- 1 a**  $y = 2x + 1$       **b**  $y = 3x + 7$   
**c**  $y = -x - 3$       **d**  $y = -4x - 11$   
**e**  $y = \frac{1}{2}x + 12$       **f**  $y = -\frac{2}{3}x - 5$   
**g**  $y = 2x$       **h**  $y = -\frac{1}{2}x + 2b$   
**2**  $y = 3x - 6$   
**3**  $y = 2x + 8$   
**4**  $2x - 3y + 24 = 0$   
**5**  $-\frac{1}{5}$   
**6**  $y = \frac{2}{5}x + 3$   
**7**  $2x + 3y - 12 = 0$   
**8**  $\frac{8}{5}$   
**9**  $y = \frac{4}{3}x - 4$   
**10**  $6x + 15y - 10 = 0$

## Exercise 5D

- 1 a**  $y = 4x - 4$       **b**  $y = x + 2$   
**c**  $y = 2x + 4$       **d**  $y = 4x - 23$   
**e**  $y = x - 4$       **f**  $y = \frac{1}{2}x + 1$   
**g**  $y = -4x - 9$       **h**  $y = -8x - 33$   
**i**  $y = \frac{6}{5}x$       **j**  $y = \frac{2}{7}x + \frac{5}{14}$

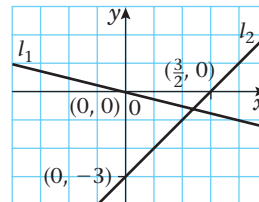
- 2**  $(-3, 0)$   
**3**  $(0, 1)$   
**4**  $(0, 3\frac{1}{2})$   
**5**  $y = -\frac{4}{3}x + 4$   
**6**  $x - y + 5 = 0$   
**7**  $y = -\frac{3}{8}x + \frac{1}{2}$   
**8**  $y = 4x + 13$   
**9**  $y = x + 2, y = -\frac{1}{6}x - \frac{1}{3}, y = -6x + 23$   
**10**  $(3, -1)$

## Exercise 5E

- 1 a** Perpendicular      **b** Parallel  
**c** Neither      **d** Perpendicular  
**e** Perpendicular      **f** Parallel  
**g** Parallel      **h** Perpendicular  
**i** Perpendicular      **j** Parallel  
**k** Neither      **l** Perpendicular  
**2**  $y = -\frac{1}{3}x$   
**3**  $4x - y + 15 = 0$   
**4 a**  $y = -2x + \frac{1}{2}$       **b**  $y = \frac{1}{2}x$   
**c**  $y = -x - 3$       **d**  $y = \frac{1}{2}x - 8$   
**5 a**  $y = 3x + 11$       **b**  $y = -\frac{1}{3}x + \frac{13}{3}$   
**c**  $y = \frac{2}{3}x + 2$       **d**  $y = -\frac{3}{2}x + \frac{17}{2}$   
**6**  $3x + 2y - 5 = 0$   
**7**  $7x - 4y + 2 = 0$

## Mixed exercise 5F

- 1 a**  $y = -3x + 14$       **b**  $(0, 14)$   
**2 a**  $y = -\frac{1}{2}x + 4$       **b**  $y = -\frac{1}{2}x + \frac{3}{2}, (1, 1)$   
**3 a**  $y = \frac{1}{7}x + \frac{12}{7}, y = -x + 12$       **b**  $(9, 3)$   
**4 a**  $y = -\frac{5}{12}x + \frac{11}{6}$       **b**  $-22$   
**5 a**  $y = \frac{3}{2}x - \frac{3}{2}$       **b**  $(3, 3)$   
**6**  $11x - 10y + 19 = 0$   
**7 a**  $y = -\frac{1}{2}x + 3$       **b**  $y = \frac{1}{4}x + \frac{9}{4}$   
**8 a**  $y = \frac{3}{2}x - 2$       **b**  $(4, 4)$       **c**  $20$   
**9 a**  $2x + y = 20$       **b**  $y = \frac{1}{3}x + \frac{4}{3}$   
**10 a**  $\frac{1}{2}$       **b**  $6$       **c**  $2x + y - 16 = 0$   
**11 a**  $\left(\frac{3 + \sqrt{3}}{1 + \sqrt{3}}\right) = \sqrt{3}$       **b**  $y = \sqrt{3}x + 2\sqrt{3}$   
**12 a**  $7x + 5y - 18 = 0$       **b**  $\frac{162}{35}$   
**13 b**  $y = \frac{1}{3}x + \frac{1}{3}$   
**14 a**



- b**  $(\frac{4}{3}, -\frac{1}{3})$       **c**  $12x - 3y - 17 = 0$   
**15 a**  $x + 2y - 16 = 0$       **b**  $y = -4x$   
**c**  $(-\frac{16}{7}, \frac{64}{7})$

# Chapter 6 Answers

## Exercise 6A

- 24, 29, 34  
Add 5 to previous term
- 2, -2, 2  
Multiply previous term by -1
- 18, 15, 12  
Subtract 3 from previous term
- 162, 486, 1458  
Multiply previous term by 3
- $\frac{1}{4}, -\frac{1}{8}, +\frac{1}{16}$   
Multiply previous term by  $-\frac{1}{2}$
- 41, 122, 365  
Multiply previous term by 3 then -1
- 8, 13, 21  
Add together the two previous terms
- $\frac{5}{9}, \frac{6}{11}, \frac{7}{13}$   
Add 1 to previous numerator,  
add 2 to previous denominator
- 2.0625, 2.031 25, 2.015 625  
Divide previous term by 2 then +1
- 24, 35, 48  
Add consecutive odd numbers to previous term

## Exercise 6B

- |                               |                     |                      |                        |
|-------------------------------|---------------------|----------------------|------------------------|
| <b>a</b> $U_1 = 5$            | $U_2 = 8$           | $U_3 = 11$           | $U_{10} = 32$          |
| <b>b</b> $U_1 = 7$            | $U_2 = 4$           | $U_3 = 1$            | $U_{10} = -20$         |
| <b>c</b> $U_1 = 6$            | $U_2 = 9$           | $U_3 = 14$           | $U_{10} = 105$         |
| <b>d</b> $U_1 = 4$            | $U_2 = 1$           | $U_3 = 0$            | $U_{10} = 49$          |
| <b>e</b> $U_1 = -2$           | $U_2 = 4$           | $U_3 = -8$           | $U_{10} = 1024$        |
| <b>f</b> $U_1 = \frac{1}{3}$  | $U_2 = \frac{1}{2}$ | $U_3 = \frac{3}{5}$  | $U_{10} = \frac{5}{6}$ |
| <b>g</b> $U_1 = -\frac{1}{3}$ | $U_2 = \frac{1}{2}$ | $U_3 = -\frac{3}{5}$ | $U_{10} = \frac{5}{6}$ |
| <b>h</b> $U_1 = -1$           | $U_2 = 0$           | $U_3 = 1$            | $U_{10} = 512$         |
- |             |            |             |             |
|-------------|------------|-------------|-------------|
| <b>a</b> 14 | <b>b</b> 9 | <b>c</b> 11 | <b>d</b> 9  |
| <b>e</b> 6  | <b>f</b> 9 | <b>g</b> 8  | <b>h</b> 14 |
| <b>i</b> 4  | <b>j</b> 5 |             |             |
- $U_n = 4n^2 + 4n = 4(n^2 + n)$  which is a multiple of 4
- $U_n = (n-5)^2 + 2 > 0$   $U_n$  is smallest when  $n = 5$  ( $U_n = 2$ )
- $a = 12, b = -22$
- $a = 1, b = 3, c = 20$
- $p = \frac{1}{2}, q = 5\frac{1}{2}$

## Exercise 6C

- |                           |                       |
|---------------------------|-----------------------|
| <b>a</b> 1, 4, 7, 10      | <b>b</b> 9, 4, -1, -6 |
| <b>c</b> 3, 6, 12, 24     | <b>d</b> 2, 5, 11, 23 |
| <b>e</b> 10, 5, 2.5, 1.25 | <b>f</b> 2, 3, 8, 63  |
| <b>g</b> 3, 5, 13, 31     |                       |
- |  |
|--|
| <b>a</b> $U_{k+1} = U_k + 2, U_1 = 3$                |
| <b>b</b> $U_{k+1} = U_k - 3, U_1 = 20$               |
| <b>c</b> $U_{k+1} = 2U_k, U_1 = 1$                   |
| <b>d</b> $U_{k+1} = \frac{U_k}{4}, U_1 = 100$        |
| <b>e</b> $U_{k+1} = -1 \times U_k, U_1 = 1$          |
| <b>f</b> $U_{k+1} = 2U_k + 1, U_1 = 3$               |
| <b>g</b> $U_{k+1} = (U_k)^2 + 1, U_1 = 0$            |
| <b>h</b> $U_{k+1} = \frac{U_k + 2}{2}, U_1 = 26$     |
| <b>i</b> $U_{k+2} = U_{k+1} + U_k, U_1 = 1, U_2 = 1$ |
| <b>j</b> $U_{k+1} = 2U_k + 2(-1)^{k+1}, U_1 = 4$     |

- |   |
|---|
| <b>a</b> $U_{k+1} = U_k + 2, U_1 = 1$               |
| <b>b</b> $U_{k+1} = U_k + 3, U_1 = 5$               |
| <b>c</b> $U_{k+1} = U_k + 1, U_1 = 3$               |
| <b>d</b> $U_{k+1} = U_k + \frac{1}{2}, U_1 = 1$     |
| <b>e</b> $U_{k+1} = U_k + 2k + 1, U_1 = 1$          |
| <b>f</b> $U_{k+1} = U_k - (-1)^k(2k + 1), U_1 = -1$ |
- a**  $3k + 2$       **b**  $3k^2 + 2k + 2$       **c**  $\frac{10}{3}, -4$
- a**  $4 - 2p$       **b**  $4 - 6p$       **c**  $p = -2$

## Exercise 6D

- Arithmetic sequences are **a, b, c, h, l**
- |                        |                               |
|------------------------|-------------------------------|
| <b>a</b> $23, 2n + 3$  | <b>b</b> $32, 3n + 2$         |
| <b>c</b> $-3, 27 - 3n$ | <b>d</b> $35, 4n - 5$         |
| <b>e</b> $10x, nx$     | <b>f</b> $a + 9d, a + (n-1)d$ |
- a** £5800      **b** £(3800 + 200m)
- |             |             |             |
|-------------|-------------|-------------|
| <b>a</b> 22 | <b>b</b> 40 | <b>c</b> 39 |
| <b>d</b> 46 | <b>e</b> 18 | <b>f</b> n  |

## Exercise 6E

- |                         |                          |
|-------------------------|--------------------------|
| <b>a</b> $78, 4n - 2$   | <b>b</b> $42, 2n + 2$    |
| <b>c</b> $23, 83 - 3n$  | <b>d</b> $39, 2n - 1$    |
| <b>e</b> $-27, 33 - 3n$ | <b>f</b> $59, 3n - 1$    |
| <b>g</b> $39p, (2n-1)p$ | <b>h</b> $-71x, (9-4n)x$ |
- |             |              |             |
|-------------|--------------|-------------|
| <b>a</b> 30 | <b>b</b> 29  | <b>c</b> 32 |
| <b>d</b> 31 | <b>e</b> 221 | <b>f</b> 77 |
- $d = 6$
- $a = 36, d = -3, 14$ th term
- 24
- $x = 5; 25, 20, 15$
- $x = \frac{1}{2}, x = 8$

## Exercise 6F

- |                |                        |                |
|----------------|------------------------|----------------|
| <b>a</b> 820   | <b>b</b> 450           | <b>c</b> -1140 |
| <b>d</b> -294  | <b>e</b> 1440          | <b>f</b> 1425  |
| <b>g</b> -1155 | <b>h</b> $21(11x + 1)$ |                |
- |             |                              |
|-------------|------------------------------|
| <b>a</b> 20 | <b>b</b> 25                  |
| <b>c</b> 65 | <b>d</b> 4 or 14 (2 answers) |
- 2550
- i** £222 500      **ii** £347 500
- 1683, 3267
- £9.03, 141 days
- $d = -\frac{1}{2}, -5.5$
- $a = 6, d = -2$

## Exercise 6G

- |                                      |                                     |
|--------------------------------------|-------------------------------------|
| <b>a</b> $\sum_{r=1}^{10} (3r + 1)$  | <b>b</b> $\sum_{r=1}^{30} (3r - 1)$ |
| <b>c</b> $\sum_{r=1}^{11} 4(11 - r)$ | <b>d</b> $\sum_{r=1}^{16} 6r$       |
- |               |              |
|---------------|--------------|
| <b>a</b> 45   | <b>b</b> 210 |
| <b>c</b> 1010 | <b>d</b> 70  |
- 19
- 49

**Mixed exercise 6H**

- 1** 5, 8, 11  
**2** 10  
**3** 2, 9, 23, 51  
**4 a** Add 6 to the previous term, i.e.  $U_{n+1} = U_n + 6$   
 (or  $U_n = 6n - 1$ )  
**b** Add 3 to the previous term, i.e.  $U_{n+1} = U_n + 3$   
 (or  $U_n = 3n$ )  
**c** Multiply the previous term by 3,  
 i.e.  $U_{n+1} = 3U_n$  (or  $U_n = 3^{n-1}$ )  
**d** Subtract 5 from the previous term,  
 i.e.  $U_{n+1} = U_n - 5$  (or  $U_n = 15 - 5n$ )  
**e** The square numbers ( $U_n = n^2$ )  
**f** Multiply the previous term by 1.2,  
 i.e.  $U_{n+1} = 1.2U_n$  (or  $U_n = (1.2)^{n-1}$ )

Arithmetic sequences are:

- a**  $a = 5, d = 6$   
**b**  $a = 3, d = 3$   
**d**  $a = 10, d = -5$
- 5 a** 81                      **b** 860  
**6 b** 5050  
**7** 32  
**8 a** £13 780  
**c** £42 198  
**9 a**  $a = 25, d = -3$       **b** -3810  
**10 a** 26 733                **b** 53 467  
**11 a** 5                      **b** 45  
**12 a**  $-4k + 15$   
**b**  $-8k^2 + 30k - 30$   
**c**  $-\frac{1}{4}, 4$   
**13 b** 1500 m  
**15 a**  $U_2 = 2k - 4, U_3 = 2k^2 - 4k - 4$   
**b** 5, -3  
**16 a** £2450  
**b** £59 000  
**c**  $d = 30$   
**17 a**  $d = 5$   
**b** 59  
**18 b**  $\frac{11k - 9}{3}$   
**c** 1.5  
**d** 415

# Chapter 7 Answers

## Exercise 7A

- 1 **a** **i** 7      **ii** 6.5      **iii** 6.1  
     **iv** 6.01      **v**  $h + 6$   
**b** 6  
 2 **a** **i** 9      **ii** 8.5      **iii** 8.1  
     **iv** 8.01      **v**  $8 + h$   
**b** 8

## Exercise 7B

- 1  $7x^6$       2  $8x^7$       3  $4x^3$   
 4  $\frac{1}{3}x^{-\frac{2}{3}}$       5  $\frac{1}{4}x^{-\frac{4}{3}}$       6  $\frac{1}{3}x^{-\frac{2}{3}}$   
 7  $-3x^{-4}$       8  $-4x^{-5}$       9  $-2x^{-3}$   
 10  $-5x^{-6}$       11  $-\frac{1}{3}x^{-\frac{4}{3}}$       12  $-\frac{1}{2}x^{-\frac{3}{2}}$   
 13  $-2x^{-3}$       14 1      15  $3x^2$   
 16  $9x^8$       17  $5x^4$       18  $3x^2$

## Exercise 7C

- 1 **a**  $4x - 6$       **b**  $x + 12$       **c**  $8x$   
     **d**  $16x + 7$       **e**  $4 - 10x$   
 2 **a** 12      **b** 6      **c** 7  
     **d**  $2\frac{1}{2}$       **e** -2      **f** 4  
 3 4, 0  
 4  $(-1, -8)$   
 5 1, -1  
 6 6, -4

## Exercise 7D

- 1 **a**  $4x^3 - x^{-2}$       **b**  $-x^{-3}$       **c**  $-x^{-\frac{3}{2}}$   
 2 **a** 0      **b**  $11\frac{1}{2}$   
 3 **a**  $(2\frac{1}{2}, -6\frac{1}{4})$       **b**  $(4, -4)$  and  $(2, 0)$   
     **c**  $(16, -31)$       **d**  $(\frac{1}{2}, 4)$   $(-\frac{1}{2}, -4)$

## Exercise 7E

- 1 **a**  $x^{-\frac{1}{2}}$       **b**  $-6x^{-3}$       **c**  $-x^{-4}$   
     **d**  $\frac{4}{3}x^3 - 2x^2$       **e**  $-6x^{-4} + \frac{1}{2}x^{-\frac{1}{2}}$   
     **f**  $\frac{1}{3}x^{-\frac{2}{3}} - \frac{1}{2}x^{-2}$       **g**  $-3x^{-2}$       **h**  $3 + 6x^{-2}$   
     **i**  $5x^{\frac{3}{2}} + \frac{3}{2}x^{-\frac{1}{2}}$       **j**  $3x^2 - 2x + 2$       **k**  $12x^3 + 18x^2$   
     **l**  $24x - 8 + 2x^{-2}$   
 2 **a** 1      **b**  $\frac{2}{9}$       **c** -4      **d** 4

## Exercise 7F

- 1  $24x + 3, 24$   
 2  $15 - 3x^{-2}, 6x^{-3}$   
 3  $\frac{9}{2}x^{-\frac{1}{2}} + 6x^{-3}, -\frac{9}{4}x^{-\frac{3}{2}} - 18x^{-4}$   
 4  $30x + 2, 30$   
 5  $-3x^{-2} - 16x^{-3}, 6x^{-3} + 48x^{-4}$

## Exercise 7G

- 1  $2t - 3$       2  $2\pi$   
 3  $-12t^{-2}$       4 9.8  
 5  $1 - 5r^{-2}$       6  $-12 + 8t$   
 7  $10 - 2x$

## Exercise 7H

- 1 **a**  $y + 3x - 6 = 0$       **b**  $4y - 3x - 4 = 0$   
     **c**  $3y - 2x - 18 = 0$       **d**  $y = x$   
     **e**  $y = 12x + 14$       **f**  $y = 16x - 22$   
 2 **a**  $7y + x - 48 = 0$       **b**  $17y + 2x - 212 = 0$   
 3  $(1\frac{2}{5}, 1\frac{8}{5})$   
 4  $y = -x, 4y + x - 9 = 0; (-3, 3)$   
 5  $y = -8x + 10, 8y - x - 145 = 0$

## Exercise 7I

- 1 4,  $11\frac{3}{4}$ ,  $17\frac{25}{27}$   
 2 0,  $\pm 2\sqrt{2}$   
 3  $(-1, 0)$  and  $(1\frac{2}{3}, 9\frac{13}{27})$   
 4 2,  $2\frac{2}{3}$   
 5  $(2, -13)$  and  $(-2, 15)$   
 6 **a**  $1 - \frac{9}{x^2}$       **b**  $x = \pm 3$   
 7  $x = 4, y = 20$   
 8  $\frac{3}{2}x^{-\frac{1}{2}} + 2x^{-\frac{3}{2}}$   
 9 **a**  $\frac{dy}{dx} = 6x^{-\frac{1}{2}} - \frac{3}{2}x^{\frac{1}{2}}$       **b**  $(4, 16)$   
      $= \frac{1}{2}x^{-\frac{1}{2}}(12 - 3x)$   
      $= \frac{3}{2}x^{-\frac{1}{2}}(4 - x)$   
 10 **a**  $x + x^{\frac{3}{2}} - x^{-\frac{1}{2}} - 1$   
     **b**  $1 + \frac{3}{2}x^{\frac{1}{2}} + \frac{1}{2}x^{-\frac{3}{2}}$   
     **c**  $4\frac{1}{16}$   
 11  $6x^2 + \frac{1}{2}x^{-\frac{1}{2}} - 2x^{-2}$   
 12  $\frac{10}{3}, \frac{2300\pi}{27}$   
 14  $a = 1, b = -4, c = 5$   
 15 **a**  $3x^2 - 10x + 5$   
     **b** **i**  $\frac{1}{3}$       **ii**  $y = 2x - 7$       **iii**  $\sqrt[3]{5}$   
 16  $y = 9x - 4$  and  $9y + x = 128$   
 17 **a**  $(\frac{4}{5}, -\frac{2}{5})$       **b**  $\frac{1}{5}$



# Chapter 8 Answers

## Exercise 8A

- 1  $y = \frac{1}{6}x^6 + c$       2  $y = 2x^5 + c$   
 3  $y = x^3 + c$       4  $y = x^{-1} + c$   
 5  $y = 2x^{-2} + c$       6  $y = \frac{3}{5}x^{\frac{5}{3}} + c$   
 7  $y = \frac{8}{3}x^{\frac{3}{2}} + c$       8  $y = -\frac{2}{7}x^7 + c$   
 9  $y = \frac{1}{2}x^6 + c$       10  $y = -x^{-3} + c$   
 11  $y = 2x^{\frac{1}{2}} + c$       12  $y = -10x^{-\frac{1}{2}} + c$   
 13  $y = 4x^{-\frac{1}{2}} + c$       14  $y = \frac{9}{2}x^{\frac{4}{3}} + c$   
 15  $y = 3x^{12} + c$       16  $y = 2x^{-7} + c$   
 17  $y = -9x^{\frac{1}{3}} + c$       18  $y = -5x + c$   
 19  $y = 3x^2 + c$       20  $y = \frac{10}{3}x^{0.6} + c$

## Exercise 8B

- 1 a  $y = 2x^2 + x^{-1} + 4x^{\frac{3}{2}} + c$   
 b  $y = 5x^3 - 3x^{-2} + 2x^{-\frac{3}{2}} + c$   
 c  $y = \frac{1}{4}x^4 - 3x^{\frac{1}{2}} + 6x^{-1} + c$   
 d  $y = x^4 + 3x^{\frac{1}{3}} + x^{-1} + c$   
 e  $y = 4x + 4x^{-3} + 4x^{\frac{1}{2}} + c$   
 f  $y = 3x^{\frac{5}{3}} - 2x^5 - \frac{1}{2}x^{-2} + c$   
 g  $y = 4x^{-\frac{1}{3}} - 3x + 4x^2 + c$   
 h  $y = x^5 + 2x^{-\frac{1}{2}} + 3x^{-4} + c$   
 2 a  $f(x) = 6x^2 - 3x^{-\frac{1}{2}} + 5x + c$   
 b  $f(x) = x^6 - x^{-6} + x^{-\frac{1}{6}} + c$   
 c  $f(x) = x^{\frac{1}{2}} + x^{-\frac{1}{2}} + c$   
 d  $f(x) = 5x^2 - 4x^{-2} + c$   
 e  $f(x) = 3x^{\frac{2}{3}} - 6x^{-\frac{2}{3}} + c$   
 f  $f(x) = 3x^3 - 2x^{-2} + \frac{1}{2}x^{\frac{1}{2}} + c$   
 g  $f(x) = \frac{1}{3}x^3 - x^{-1} + \frac{2}{3}x^{\frac{3}{2}} + c$   
 h  $f(x) = x^{-2} - x^2 + \frac{4}{3}x^{\frac{3}{2}} + c$

## Exercise 8C

- 1  $\frac{1}{4}x^4 + x^2 + c$       2  $-2x^{-1} + 3x + c$   
 3  $2x^{\frac{5}{2}} - x^3 + c$       4  $\frac{4}{3}x^{\frac{3}{2}} - 4x^{\frac{1}{2}} + 4x + c$   
 5  $x^4 + x^{-3} + rx + c$       6  $t^3 + t^{-1} + c$   
 7  $\frac{2}{3}t^3 + 6t^{-\frac{1}{2}} + t + c$       8  $\frac{1}{2}x^2 + 2x^{\frac{1}{2}} - 2x^{-\frac{1}{2}} + c$   
 9  $\frac{p}{5}x^5 + 2tx - 3x^{-1} + c$       10  $\frac{p}{4}t^4 + q^2t + px^3t + c$

## Exercise 8D

- 1 a  $\frac{1}{2}x^4 + x^3 + c$       b  $2x - \frac{3}{x} + c$   
 c  $\frac{4}{3}x^3 + 6x^2 + 9x + c$       d  $\frac{2}{3}x^3 + \frac{1}{2}x^2 - 3x + c$   
 e  $\frac{4}{5}x^{\frac{5}{2}} + 2x^{\frac{3}{2}} + c$   
 2 a  $\frac{1}{3}x^3 + 2x^2 + 4x + c$       b  $\frac{1}{3}x^3 + 2x - \frac{1}{x} + c$   
 c  $\frac{1}{2}x^2 + \frac{8}{3}x^{\frac{3}{2}} + 4x + c$       d  $\frac{2}{5}x^{\frac{5}{2}} + \frac{4}{3}x^{\frac{3}{2}} + c$   
 e  $\frac{2}{3}x^{\frac{3}{2}} + 4x^{\frac{1}{2}} + c$       f  $2x^{\frac{1}{2}} + \frac{4}{3}x^{\frac{3}{2}} + c$   
 3 a  $2x^{\frac{3}{2}} - \frac{1}{x} + c$       b  $4x^{\frac{1}{2}} + x^3 + c$   
 c  $\frac{3}{5}x^{\frac{5}{3}} - \frac{2}{x^2} + c$       d  $-\frac{1}{x^2} - \frac{1}{x} + 3x + c$   
 e  $\frac{1}{4}x^4 - \frac{1}{3}x^3 + \frac{3}{2}x^2 - 3x + c$   
 f  $4x^{\frac{1}{2}} + \frac{6}{5}x^{\frac{5}{2}} + c$       g  $\frac{1}{3}x^3 - 3x^2 + 9x + c$   
 h  $\frac{8}{5}x^{\frac{5}{2}} + \frac{8}{3}x^{\frac{3}{2}} + 2x^{\frac{1}{2}} + c$   
 i  $3x + 2x^{\frac{1}{2}} + 2x^3 + c$       j  $\frac{2}{5}x^{\frac{5}{2}} + 3x^2 + 6x^{\frac{3}{2}} + c$

## Exercise 8E

- 1 a  $y = x^3 + x^2 - 2$       b  $y = x^4 - \frac{1}{x^2} + 3x + 1$   
 c  $y = \frac{2}{3}x^{\frac{3}{2}} + \frac{1}{12}x^3 + \frac{1}{3}$       d  $y = 6\sqrt{x} - \frac{1}{2}x^2 - 4$   
 e  $y = \frac{1}{3}x^3 + 2x^2 + 4x + \frac{2}{3}$       f  $y = \frac{2}{5}x^{\frac{5}{2}} + 6x^{\frac{1}{2}} + 1$   
 2  $f(x) = \frac{1}{2}x^4 + \frac{1}{x} + \frac{1}{2}$   
 3  $y = 1 - \frac{2}{\sqrt{x}} - \frac{3}{x}$   
 4 a  $f_2(x) = \frac{x^3}{3}$ ;  $f_3(x) = \frac{x^4}{12}$   
 b  $\frac{x^{n+1}}{3 \times 4 \times 5 \times \dots \times (n+1)}$   
 5  $f_2(x) = x + 1$ ;  $f_3(x) = \frac{1}{2}x^2 + x + 1$ ;  
 $f_4(x) = \frac{1}{6}x^3 + \frac{1}{2}x^2 + x + 1$

## Mixed Exercise 8F

- 1 a  $\frac{2}{3}x^3 - \frac{3}{2}x^2 - 5x + c$       b  $\frac{3}{4}x^{\frac{4}{3}} + \frac{3}{2}x^{\frac{2}{3}} + c$   
 2  $\frac{1}{3}x^3 - \frac{3}{2}x^2 + \frac{2}{x} + \frac{1}{6}$   
 3 a  $2x^4 - 2x^3 + 5x + c$       b  $2x^{\frac{5}{2}} + \frac{4}{3}x^{\frac{3}{2}} + c$   
 4  $\frac{4}{5}x^{\frac{5}{2}} - \frac{2}{3}x^{\frac{3}{2}} - 6x^{\frac{1}{2}} + c$   
 5  $x = t^3 - t^2 + t + 1$ ;  $x = 7$   
 6  $2x^{\frac{3}{2}} + 4x^{\frac{1}{2}} + c$   
 7  $x = 12\frac{1}{3}$   
 8 a  $A = 6$ ,  $B = 9$       b  $\frac{3}{5}x^{\frac{5}{3}} + \frac{9}{2}x^{\frac{4}{3}} + 9x + c$   
 9 a  $\frac{3}{2}x^{-\frac{1}{2}} + 2x^{-\frac{3}{2}}$       b  $2x^{\frac{3}{2}} - 8x^{\frac{1}{2}} + c$   
 10 a  $5x - 8x^{\frac{1}{2}} - \frac{2}{3}x^{\frac{3}{2}} + c$

# Review Exercise 2

## (Chapters 5 to 8) Answers

1 a Since  $P(3, -1)$ , substitute values into  $y = 5 - 2x$  gives  $-1 = 5 - 6$ , so  $P$  on line.

b  $x - 2y - 5 = 0$

2 a  $AB = 5\sqrt{2}$

b  $0 = x - 7y + 9$

c  $C$  is  $(0, \frac{9}{7})$

3 a  $0 = x - 3y - 21$

b  $P = (3, -6)$

c 10.5 units<sup>2</sup>

4 a  $p = 15, q = -3$

b  $7x - 5y - 46 = 0$

c  $x = 11\frac{4}{7}$

5 a  $y = -\frac{1}{3}x + 4$

b  $C$  is  $(3, 3)$

c 15 units<sup>2</sup>

6 a  $P$  is  $(\frac{11}{8}, \frac{13}{16})$

b  $\frac{121}{64}$  units<sup>2</sup>

7 a  $d = 3.5$

b  $a = -10$

c 217.5

8  $a = 5$  km,  $d = 0.4$  km

9 a  $-3, -1, 1$

b  $d = 2$

c  $n(n - 4)$

10 a £750

b £14 500

c £155

11 a  $a_2 = 4, a_3 = 7$

b 73

12 a  $a_1 = k, a_2 = 3k + 5$

b  $a_3 = 3a_2 + 5 = 9k + 20$

c i  $40k + 90$  ii  $10(4k + 9)$

13 a  $a_5 = 16k - 45$

b  $k = 4$

c 81

14 a In general:

$$S_n = a + (a + d) + (a + 2d) + \dots + (a + (n - 2)d) + (a + (n - 1)d)$$

Reversing the sum:

$$S_n = (a + (n - 1)d) + (a + (n - 2)d) + (a + (n - 3)d) + \dots + (a + d) + a$$

Adding the two sums:

$$2S_n = [2a + (n - 1)d] + [2a + (n - 1)d] + \dots + [2a + (n - 1)d]$$

$$2S_n = n[2a + (n - 1)d]$$

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

b £109

c  $n^2 - 150n + 5000 = 0$

d  $n = 50$  or  $100$

e  $n = 100$  (gives a negative repayment)

15 a  $a_2 = 4 - 2k$

$a_3 = (4 - 2k)^2 - k(4 - 2k) = 6k^2 - 20k + 16$

b  $k = 1$  or  $k = \frac{7}{3}$

c  $a_2 = -\frac{2}{3}$

d  $a_5 = 2$

e  $a_{100} = -\frac{2}{3}$

16  $\frac{dy}{dx} = 12x^2 + x^{-\frac{1}{2}}$

17 a  $\frac{dy}{dx} = 4x + 18x^{-4}$

b  $\frac{2}{3}x^3 + 3x^{-2} + c$

18 a  $\frac{dy}{dx} = 6x + 2x^{-\frac{1}{2}}$

b  $\frac{d^2y}{dx^2} = 6 - x^{-\frac{3}{2}}$

c  $x^3 + \frac{8}{3}x^{\frac{3}{2}} + c$

19 a i  $\frac{dy}{dx} = 15x^2 + 7$  ii  $\frac{d^2y}{dx^2} = 30x$

b  $x + 2x^{\frac{3}{2}} + x^{-1} + c$

20 a  $\frac{dy}{dx} = 4 + \frac{9}{2}x^{\frac{1}{2}} - 4x$

b Substitute values,  $8 = 8$

c  $3y = x + 20$

d  $PQ = 8\sqrt{10}$

21 a  $\frac{dy}{dx} = 8x - 5x^{-2}$ , at  $P$  this is 3

b  $y = 3x + 5$

c  $k = -\frac{5}{3}$

22 a At  $(3, 0), y = 0$

b At  $P, y = -7x + 21$

c  $Q = (5, -15\frac{1}{3})$

23 a  $P = 2, Q = 9, R = 4$

b  $3x^{\frac{1}{2}} + \frac{9}{2}x^{-\frac{1}{2}} - 2x^{-\frac{3}{2}}$

c When  $x = 1, f'(x) = 5\frac{1}{2}$ , gradient of  $2y = 11x + 3$  is  $5\frac{1}{2}$ , so it is parallel with tangent.

24  $\frac{1}{3}x^3 + 2x^2 - 3x - 13$

25  $3x + 2x^{\frac{5}{2}} + 4x^{\frac{1}{2}} - 3$

26 a  $3x^2 + 2$

b  $3x^2 + 2 \geq 2$  for all values of  $x$  since  $3x^2 \geq 0$  for all values of  $x$

c  $y = \frac{1}{4}x^4 + x^2 - 7x + 10$

d  $5y + x - 22 = 0$

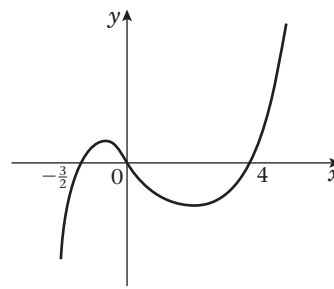
27 a  $y = -\frac{1}{3}x^{-3} + x^{-1} + \frac{4}{3}$

b  $(1, 2)$  and  $(-1, \frac{2}{3})$

28 a  $2x^3 - 5x^2 - 12x$

b  $x(2x + 3)(x - 4)$

c



$(-\frac{3}{2}, 0), (0, 0)$  and  $(4, 0)$

**29 a**  $PQ^2 = 1^2 + 13^2 = 170$   
 $PQ = \sqrt{170}$

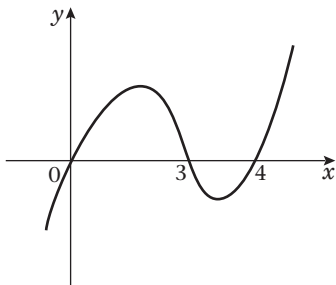
**b**  $\frac{dy}{dx} = 3x^2 - 12x - 4x^{-2}$

At P,  $\frac{dy}{dx} = -13$ , at Q,  $\frac{dy}{dx} = -13$

**c**  $x - 13y - 14 = 0$

**30 a**  $x(x-3)(x-4)$

**b**

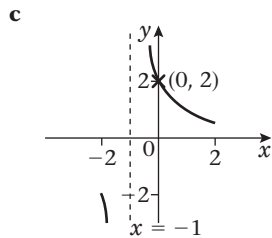
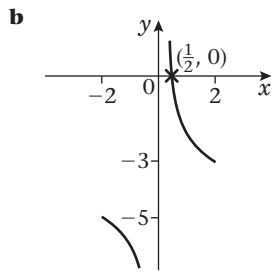
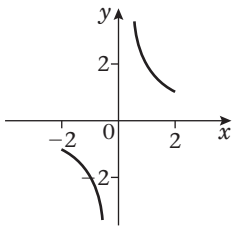


$(0, 0)$ ,  $(3, 0)$  and  $(4, 0)$

**c**  $P = (3\frac{4}{7}, -1\frac{5}{7})$

# Practice paper Answers

- 1 a** 4  
**b** 64  
**2**  $2x^3 + \frac{2}{3}x^{\frac{3}{2}} + c$   
**3 a** 3, 5  
**b** 36  
**4 a**  $27 + 10\sqrt{2}$   
**b**  $20\sqrt{2}$   
**5**  $x = -3, y = -3$  and  $x = 8, y = \frac{2}{3}$   
**6 a**  $x + 2y - 13 = 0$   
**b**  $y = 2x$   
**c**  $(2\frac{3}{5}, 5\frac{1}{5})$   
**7 a** No intersections.



- 8 a** 670                    **b** 5350                    **c** 45  
**9 a i** 2                    **ii**  $c - 4$                     **iii**  $c < 4$   
**b i**  $x < 5$   
**ii**  $x < -7, x > 3$   
**iii**  $x < -7, 3 < x < 5$   
**10 a**  $P = 9, Q = -24, R = 16$   
**b** 10  
**c**  $x + 10y - 248 = 0$

# Examination style paper

## Answers

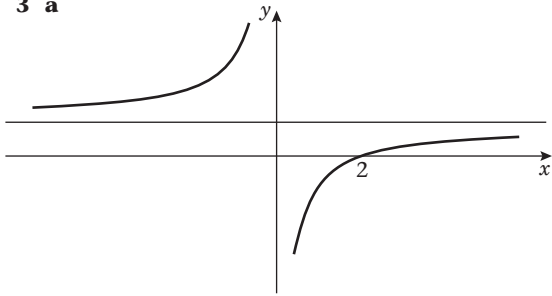
1 a  $k = 5$

b  $k = 6$

2 a 9

b  $8x^{-\frac{1}{3}}$

3 a



b  $x = 0$  and  $y = 2$

4 a -3

b 420

5 a  $0 < k < 2.4$

6 a  $a_2 = 1, a_3 = 4$

b 24

7 a  $24x^2 - \frac{3}{2}x^{-\frac{3}{2}}$

b  $48x + \frac{9}{4}x^{-\frac{3}{2}}$

c  $2x^4 + 6x^{\frac{1}{2}} + 5x + c$

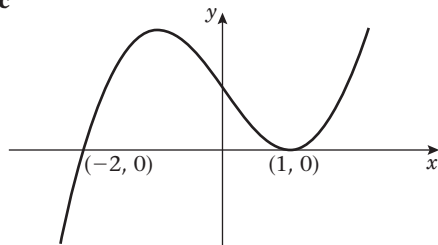
8 a -0.4

b  $(\frac{17}{3}, \frac{4}{3})$

c 4

9 a  $x^3 - 3x + 2$

c



10 a  $y = 9x + 9$

d  $16\sqrt{2}$

e 320 units<sup>2</sup>