11. 672

12. 921 164 400

13 25 200

14. 112

Long questions

1. (a) 48
(b) 72
(c) 42

2. (a) 20
(b) 22
(c) 30

3. (a) 121 080 960
(b) 3 991 680
(c) 27 941 760

4. (a) We select 2 out of 4 places to put R's in.
(b) $\binom{2n}{n}$
(c) 20
(d) $\binom{n+m-2}{n-1}$

5. (b) 2047
(c) 5775

6. (a) 4495
(b) 22
(c) 26

Chapter 2

Exercise 2A

1. (a) (i) 6^7 (ii) 5^8
(b) (i) a^8 (ii) x^9
(c) (i) 7^{-3} (ii) 5^5
(d) (i) x^2 (ii) x^5
(e) (i) g^{-12} (ii) k^{-8}

2. (a) (i) 6^1 (ii) 5^{-2}
(b) (i) a^{-2} (ii) x^3
(c) (i) 5^9 (ii) 7^{15}
(d) (i) x^6 (ii) x^{-11}
(e) (i) 2^2 (ii) 3^{-14}
(f) (i) g^6 (ii) k^{-8}

3. (a) (i) 2^{12} (ii) 3^{14}
(b) (i) 5^{-4} (ii) 7^{-6}
(c) (i) 11^2 (ii) 13^{15}
(d) (i) 2^{17} (ii) 3^3
(e) (i) 6^{12} (ii) 3^6

4. (a) (i) 2^{10} (ii) 3^{14}
(b) (i) 2^9 (ii) 2^{20}
(c) (i) 2^{13} (ii) 3^4
(d) (i) 2^9 (ii) 3^{11}
(e) (i) 2^{-6} (ii) 3^{-6}
(f) (i) 2^2 (ii) 3^{10}

5. (a) (i) $8x^6$ (ii) $9x^8$
(b) (i) $2x^6$ (ii) $3x^8$
(c) (i) $9a^{10}$ (ii) 16
(d) (i) $\frac{1}{2x}$ (ii) $\frac{y^2}{9}$
(e) (i) $\frac{2}{x}$ (ii) $3y^2$
(f) (i) $\frac{5x^2y^4}{9}$ (ii) $\frac{ab^5}{8}$
(g) (i) $\frac{p^3}{2q^2}$ (ii) $\frac{2^7 3^{10}}{x^7}$

6. (a) (i) x^3 (ii) x^{12}
(b) (i) $2x^5$ (ii) $\frac{1}{2x^4}$
(c) (i) $\frac{4}{3x^3}$ (ii) $\frac{y^{12}}{x^6}$

7. (a) (i) $\frac{5}{3}$ (ii) $-\frac{3}{2}$
(b) (i) $-\frac{1}{2}$ (ii) $-\frac{3}{4}$
(c) (i) 4 (ii) 2
(d) (i) 4 (ii) 0
(e) (i) 4 (ii) 11
(f) (i) 3 (ii) 3

8. 5×10^{-4}

9. 8cm

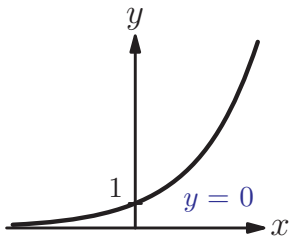
10. (a) $k=\frac{1}{3}$
(b) $A = 16\,\text{cm}^2$

11. $2^{350} = (2^7)^{50} = (128)^{50}$
$5^{150} = (5^3)^{50} = (125)^{50}$

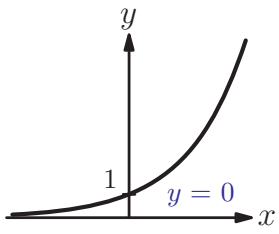
12. $b=1, a=\frac{3}{2}$

Exercise 2B

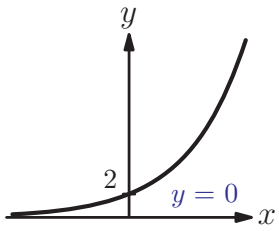
1. (a) (i)



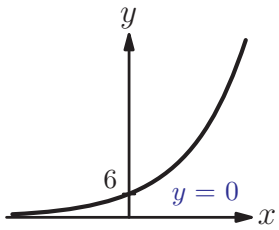
(ii)



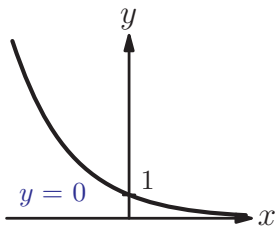
(b) (i)



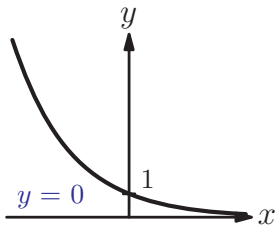
(ii)



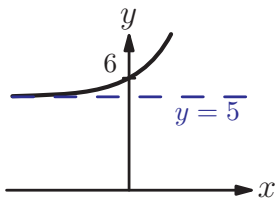
(c) (i)



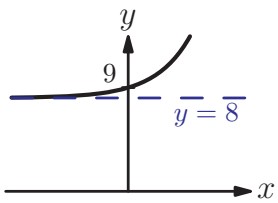
(ii)



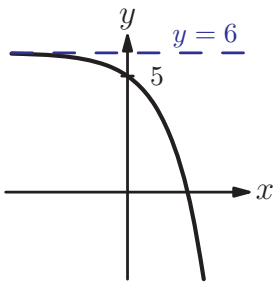
(d) (i)



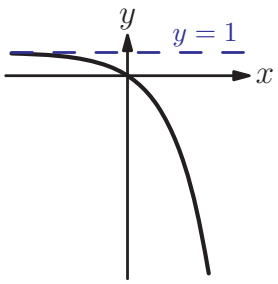
(ii)



(e) (i)



(ii)

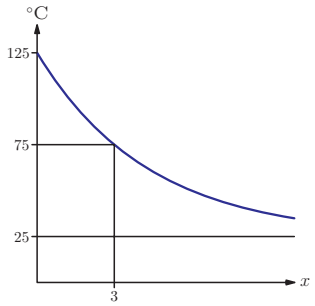


2. 13.31 m^2

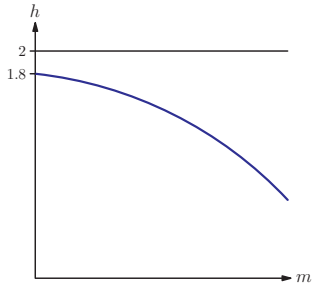
3. (a) $A = 25$, $B = 100$, $k = 3$

(b) 26°C

(c)



4. (a)

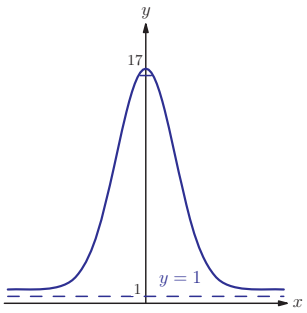


(b) 1.8 m

(c) 1.60 m

(d) The branch may not be long enough to reach the ground, or it might break before it reaches the ground.

5. (a)



(b) $x = \pm\dfrac{\sqrt{3}}{2}$

6. 41.2°C

7. (a) $0\ \text{m}^{-1}$
(b) $40\ \text{m}^{-1}$

Exercise 2C

1. (a) (i) 3.72 (ii) −0.283
(b) (i) 8.15 (ii) 1.36
(c) (i) 7.39 (ii) 0.0498
(d) (i) 8.24 (ii) 0.00274

2. $\sqrt[6]{\pi^4 + \pi^5} \approx \text{e}$

Exercise 2D

1. (a) (i) 3 (ii) 2
(b) (i) 1 (ii) 1
(c) (i) 0 (ii) 0
(d) (i) −1 (ii) −3
(e) (i) $\dfrac{1}{2}$ (ii) $\dfrac{1}{3}$
(f) (i) $\dfrac{1}{2}$ (ii) $\dfrac{1}{2}$
(g) (i) $\dfrac{2}{3}$ (ii) $\dfrac{3}{4}$
(h) (i) $\dfrac{3}{2}$ (ii) $\dfrac{5}{4}$
(i) (i) $\dfrac{3}{4}$ (ii) 2.25
(j) (i) $-\dfrac{1}{2}$ (ii) $-\dfrac{1}{2}$

2. (a) (i) 1.70 (ii) −0.602
(b) (i) −2.30 (ii) 2.30

3. (a) (i) $5\log x$ (ii) $5\log x$
(b) (i) $\log x \log y - \log y + 3\log x - 3$
(ii) $(\log x)^2 + 4\log x + 4$
(c) (i) $\dfrac{1}{\log a} + \dfrac{1}{\log b}$
(ii) $\log a + 1$

4. (a) (i) $x = 3^y$ (ii) $x = 16^y$
(b) (i) $x = a^{y+1}$ (ii) $x = a^{y^2}$
(c) (i) $x = \sqrt[3]{3y}$ (ii) $x = \sqrt{y}$

5. (a) (i) $x = 5$ (ii) $x = 2$
(b) (i) $x = 0.4$ (ii) $x = 0.25$
(c) (i) $x = 6$ (ii) $x = 100$

6. $x = 111$

7. $x = -3$

8. $x = \dfrac{\text{e}^2 + 1}{3}$

9. $x = 9, \dfrac{1}{9}$

10. $x = 81, y = 25$

11. $x = 10^{1.5} = 31.6$

12. $x = \sqrt[9]{4} = 1.17$

13. 5.50

Exercise 2E

1. (a) (i) 4 (ii) 1/2
(b) (i) 6 (ii) 3/2

2. (a) (i) $7y$ (ii) $2x + y$
(b) (i) $x + 2y - z$
(ii) $2x - y - 3z$
(c) (i) $2 - y - 5z$
(ii) $1 + y + 2z$
(d) (i) $x - 4y$
(ii) $2 + 2x + y + 2z$
(e) (i) $2 + \dfrac{y}{x}$ (ii) $\dfrac{x - z}{y} - 1$
(f) (i) $\dfrac{y}{x} \times 10^{x-y}$ (ii) $\dfrac{x + 2z}{x + y}$

3. (a) (i) $x = 2$ (ii) $x = 4$
(b) (i) $x = 9$ (ii) $x = 2$
(c) (i) $x = \dfrac{1}{4}$ (ii) $x = 8$
(d) (i) $x = 2^{\frac{12}{5}} = 5.28$
(ii) $x = 2^{10} = 1024$
(e) (i) $x = 8$ (ii) $x = 4$
(f) (i) $x = \dfrac{1}{3}$ (ii) $x = 8$

4. $\frac{1}{3}e^{\frac{3}{2}}$

5. (a) $a+2b$ (b) $2(a-b)$

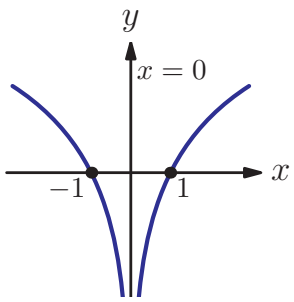
6. $x=2,\frac{1}{2}$

8. -1

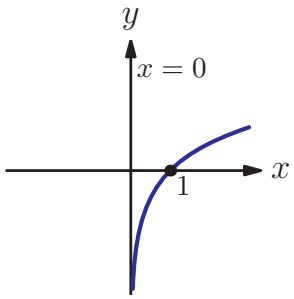
9. $a=\frac{1}{b}$

Exercise 2F

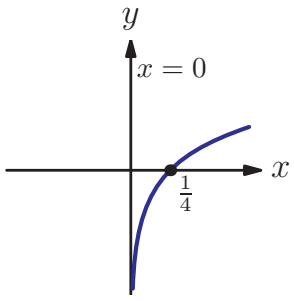
1. (a) (i)



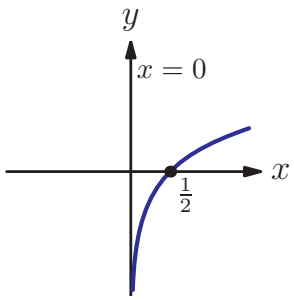
(ii)



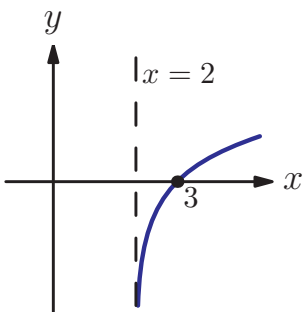
(b) (i)



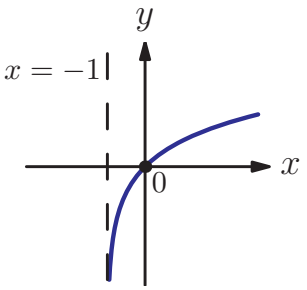
(ii)



(c) (i)



(ii)



Exercise 2G

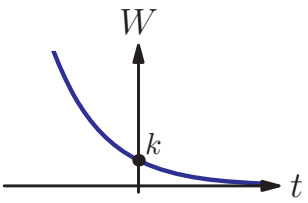
1. (a) (i) 2.45 (ii) 116
(b) (i) −0.609 (ii) 4.62
(c) (i) −1.71 (ii) 0.527
(d) (i) 1.11 (ii) −2.98

2. (a) 100
(b) 48 299
(c) 2.24 h

3. (a) 64
(b) 4.96 h

4. (a) 4.96 units
(b) 138.8 mins

5. (a)



(b) 2.3 mins

6. $\dfrac{\ln\left(\frac{5}{4}\right)}{\ln\left(\frac{1}{36}\right)}$

7. $x=10+\log_7 3$

8. 11.3 min

9. (b) 0.742

Mixed examination practice 2

Short questions

1. $x = \pm 24$

2. (a) $2a + \frac{b}{2} - c$

(b) $\frac{a-1}{2}$

(c) $\frac{b-c}{2}$

3. $x = e^{\frac{4}{3}} = 3.79, y = e^{\frac{10}{3}} = 28.0$

4. $x = 1 \pm \sqrt{1 - e^y}$

5. $x = \frac{\ln 3}{\ln 2}$

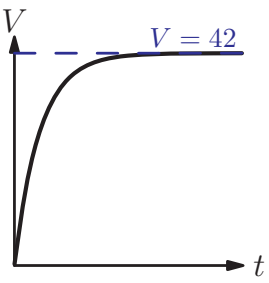
6. $a = b^{-2}$

7. $x = 5^{\frac{5}{3}}$ or $5^{\frac{-5}{3}}$

8. $x = e^2$ or e^{-2}

Long questions

1. (a)



(b) 0 ms^{-1}

(c) 42 ms^{-1}

(d) 3.71s

2. (a) $k = 37000, a = \left(\frac{22}{37}\right)^{0.1} = 0.949$

(b) 2750

(c) 2039

(d) $k = 7778, a = \left(\frac{10000}{7778}\right)^{0.1} = 1.025$

(e) 2.5%

3. (a) $y = 3x^2$

(b) $y = e^6 x^4$

(c) $y = 2e^{3x-3}$

(d) 2

Chapter 3

Exercise 3A

1. (a) Order 3, lead coefficient 3

(b) Order 5, lead coefficient –1

(c) No

(d) No

(e) No

(f) No

(g) Order 7, lead coefficient 2

(h) Order 0, lead coefficient 1

2. (a) (i) $6x^3 + 8x^2 - 29x + 14$

(ii) $3x^3 + 16x^2 + 23x + 6$

(b) (i) $2x^4 - 15x^3 + 4x^2 + 4x - 1$

(ii) $2x^4 - 7x^3 - 30x^2 + 6x + 15$

(c) (i) $b^4 + b^3 - 3b^2 + 14b - 4$

(ii) $r^4 - 11r^3 + 33r^2 - 62r + 14$

(d) (i) $-x^6 + 2x^5 + 5x^4 - 10x^3 - x^2 + 5$

(ii) $-x^6 + 2x^4 + x^3 - x^2 - x$

3. (a) (i) $x^2 + 5x - 1$

(ii) $x^2 + x - 6$

(b) (i) $3x^2 + 2x - 2$

(ii) $5x^2 - 2$

(c) (i) $x^3 - 2x^2 + 3x + 7$

(ii) $x^3 - x^2 + x + 7$

(d) (i) $x^2 + 5$

(ii) $x - 2$

4. (a) (i) $x^3 + x^2 + 3$

(ii) $x^3 + x^2 + 2$

(b) (i) $2x^2 + 3$

(ii) $x - 3$

5. (a) (i) $a = 4, b = -6$

(ii) $a = 3, b = 1$

(b) (i) $a = b = 2$

(ii) $a = 0, b = -3$

(c) (i) $a = 2, b = -2$

(ii) $a = 2, b = 5$

(d) (i) $a = -4, b = -6$

(ii) $a = 10, b = 3$

(e) (i) $a = \pm 2, b = 2$

(ii) $a = \pm 2, b = \mp 5$

7. (a) Yes (b) No