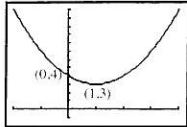
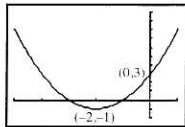


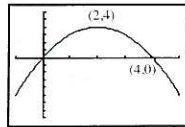
4. (a)



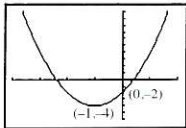
(b)



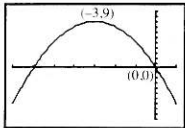
(c)



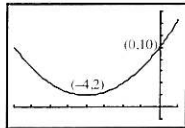
(d)



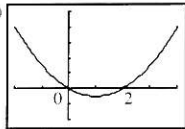
(e)



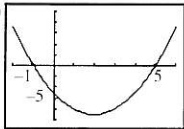
(f)



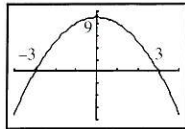
5. (a)



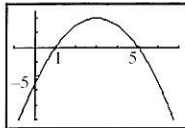
(b)



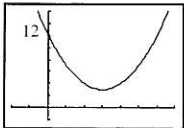
(c)



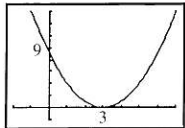
(d)



(e)



(f)



6. (a) $(-5, 15)$; $(3, 23)$ (b) $(-4, -6)$; $(2, 6)$ 7. (a) $a = 2, k = 4, c = -4$ (b) $-0.5, 4$ (c) $x = 1.75$ (d) -2.125

LEVEL 4

1. $(-\frac{k}{2}, \frac{k^2}{4} + 4)$ 2. $N_{min} = \frac{3}{4}$ 3. (a)  (b) $x = -0.5$ or $x = 2$

(c) $(-0.5, 3.75)$ & $(2, 0)$ 4. (a) $x = -a$ or $x = -1$ (b) $x = -2$ or $x = -1$

CHAPTER 7 - TOPIC TEST

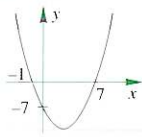
1. $x = 7$ or $x = -1$ 2. (a) $(x-8)(x-4)$ (b) $(x-6)^2$ (c) $(x-6-\sqrt{6})(x-6+\sqrt{6})$

3. $0.884, -1.88$ 4. $y = -x^2 + 2x + 3, (1, 4)$ 5. $-2, 3$ 6. $k = 3$

7. (a) i. $-(x-10)(x-4)$ ii. $x(8-x)$

$A = (4, 0), B = (8, 0)$ and $C = (10, 0)$ (b) $x = \frac{20}{3}$

(c) $\frac{80}{9}$ sq.u 8. (a) $y = -0.5x + 1$ (b) $y = 2x(2-x)$ (c) $(0.25, 0.875)$



ANSWERS TO CHAPTER 8

EXERCISE 8.1

1. (a) $\text{dom} = \{2, 3, -2\}$, $\text{ran} = \{4, -9, 9\}$ (b) $\text{dom} = \{1, 2, 3, 5, 7, 9\}$, $\text{ran} = \{2, 3, 4, 6, 8, 10\}$ (c) $\text{dom} = \{0, 1\}$, $\text{ran} = \{1, 2\}$ 2. (a) $]1, \infty[$ (b) $[0, \infty[$ (c) $]9, \infty[$ (d) $] -\infty, 1[$ (e) $[-3, 3]$ (f) $] -\infty, \infty[$ (g) $] -1, 0[$ (h) $]0, 4[$ (i) $]0, \infty[$ (j) $]1, 5[$ (k) $]0, 4[$ (l) $] -\infty, -1[\cup]1, \infty[$

3. (a) $r = [-1, \infty[$, $d = [0, 2[$ (b) $r = \{y: y \geq 0\} \setminus \{4\}$, \mathbb{R} (c) $r = [0, \infty[\setminus \{3\}$, $d = [-4, \infty[\setminus \{0\}$

(d) $r = [-2, 0[$, $d = [-1, 2[$ (e) $r =] -\infty, \infty[$, $d =] -\infty, -3[\cup]3, \infty[$ (f) $r = [-4, 4[$, $d = [0, 8]$

4. (a) one to many (b) many to one (c) many to one (d) one to one (e) many to many

(f) one to one 5. (a) $\mathbb{R} \setminus \{-2\}$ (b) $] -\infty, 9[$ (c) $[-4, 4[$ (d) $] -\infty, -2[\cup]2, \infty[$ (e) $\mathbb{R} \setminus \{0\}$ (f) \mathbb{R}

EXERCISE 8.2

Graphs with graphics calculator output have standard viewing window unless otherwise stated.

1. (a) 3, 5 (b) i. $2(x+a) + 3$ ii. $2a$ (c) 3 2. (a) $0, \frac{10}{11}$ (b) no solution (c) $[0, \frac{10}{11}]$

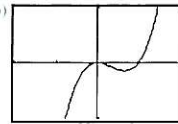
3. (a) $-0.5x^2 - x + 1.5$, $-0.5x^2 + x + 1.5$ (b) $\pm\sqrt{2}$ (c) no solution

4. (a) $x = 0, 1$

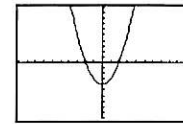
5. (a) i.

ii.

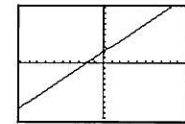
(b)



Window $[-2.2, 1.1]$
Range: $[-12, 4]$



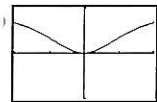
(b) i. $\{2\sqrt{2}, -2\sqrt{2}\}$ ii. $\{3, -2\}$



6. (b), (c), (d), (e) 8. (a), (d), (e), (f)

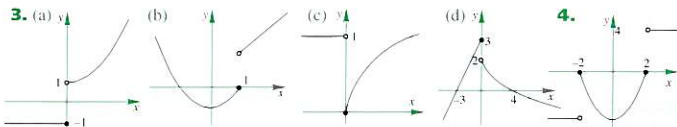
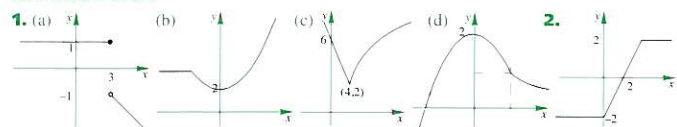
10. (a) $\{y: y > 1\} \cup \{y: y \leq -1.25\}$ (b) 10

9. (a)

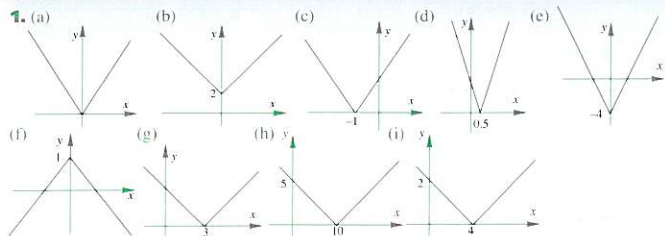


Window $[-2.2, 1.1]$
(b) $[0, 1]$

EXERCISE 8.3.1



EXERCISE 8.3.2

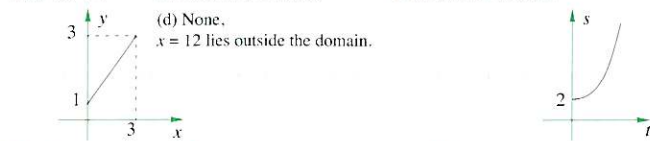


EXERCISE 8.4

1. (a) -1.62, 0.62 (b) 1, 2 (c) 1.25 (d) 1.52 (e) 1 (f) 2.04 (g) 1.25, -1.25 (h) 0.34, 8.99
 (i) No solution (j) 3 (k) 3.44 (l) -1.67

CHAPTER 8 - MISCELLANEOUS EXERCISES

1. (a) Yes (b) (c) i. $0 \leq x \leq 3$ ii. $[1, 3]$ 2. (a) 2 m (b) 66 m (c)



3. (a) $y \geq -2$ (b) i. (0, 4) ii. 1, 5 4. (a) $y \geq -2$ (b) i. (0, 4) ii. 1, 5 5. (a) 60, 44, 36, 32, 30
 (b) Use graphics calc. (c) $b = 2, a = \frac{2}{3}$ (d) $\frac{16}{3}$ minutes

6. (a) $3a = 2, -1$ 7. (b) $c = 1.5, b = 3.5$ 8. Range = $]-\infty, 7]$; Many:one



CHAPTER 8 - GRADED REVISION EXERCISES

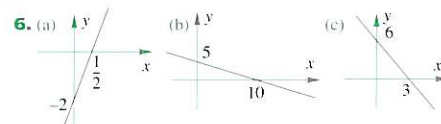
LEVEL 1

1. (a) dom = $(-1, 4]$, ran = $[0, 5]$ (b) dom = $[0, 6]$, ran = $[0, 6]$ (c) dom = $\mathbb{R} \setminus \{2\}$, ran = $\mathbb{R} \setminus \{3\}$.
 2. (a) and (c). 3. (a) $y = 2 + 2 = 4$ (b) 18 (c) 6

LEVEL 2

1. $-\frac{8}{3}$ 2. (a) $x \leq 2$ (b) $x \geq 3$ (c) $x > -1$ 3. (a) $g(f(x)) = \frac{1}{2x}$ (b) $f(g(x)) = \frac{1-x}{1+x}$

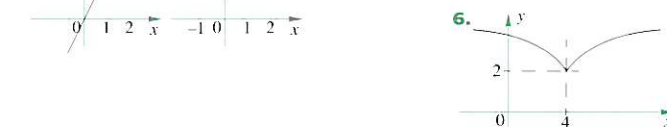
4. (a) i. ii. (b) i. ran = $[1, \infty)$ ii. ran = $[1, 5]$
 5. (a) -1 (b) $4x^2 + 4x$ (c) $x^2 - 2x$ (d) $4x$



7. (a) i. 0 ii. $h^2 - 3h$ (b) $3h + h^2$

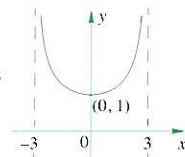
LEVEL 3

1. (a) (b) 2. i. 4 ii. $3 + x$ 3. $g(f(x)) = x; f(g(x)) = x$
 4. Calculator check. 5. $x = \frac{k}{k-1}$

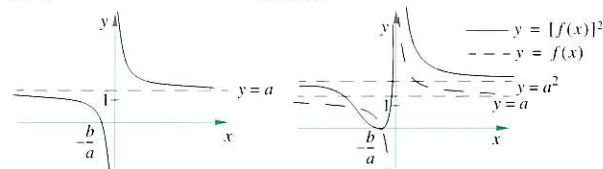


LEVEL 4

1. $S = (0, 2)$ 2. $\{\pm\sqrt{3}, \pm 1\}$ 3. $-3 < x < 3$



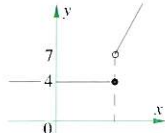
4. (a) $\therefore a = 2, b = 8, c = 6$ (b) -0.75
 5. (a) (b) i. & ii.



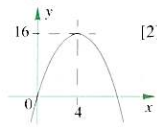
CHAPTER 8 - TOPIC TEST

1. i. 1 ii. 1

2.

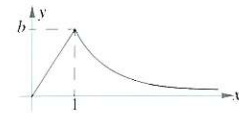


3. (a) range = $]-\infty, 16]$ (b) range = $]-\infty, 16+k]$



This occurs because all that has happened is that 'k' has been added to the function in (a) and so the graph in (a) is moved up 'k' units.

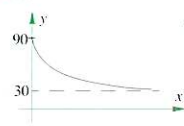
4. (b)



5. (a)

t min	1	3	7	14	29	59
T °C	60	45	37.5	34	32	31

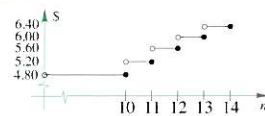
5. (b)



(c) $T \rightarrow 30$

(d) 2

6.



7. (a) $y = \begin{cases} 0.5x + 1 & \text{if } -2 \leq x < 0 \\ 1 - 0.5x & \text{if } 0 \leq x \leq 2 \end{cases}$

(b) $y = \begin{cases} -1 & \text{if } -3 < x \leq -1 \\ 0 & \text{if } -1 < x \leq 1 \\ 1 & \text{if } 1 < x \leq 3 \end{cases}$

ANSWERS TO CHAPTER 9

EXERCISE 9.1.1

1. 8 2. 4, 0, 25 3. 8, 18 4. 8 and 11 or -8 and -11 5. 6 6. 2 m 7. 51 kmh^{-1} 8. 11, 13

9. 25 days 10. 30 11. (a) 30 (b) \$50 each. 12. 6 kmh^{-1} 13. 16 14. 6 15. 3 hours 16. 9

17. (a) 15 hrs (b) 10 hrs 18. Chair-one: 20; Chair-two: 24 19. (a) 2 km (b) 2.5 km

20. 7.5 hrs, 10.5 hrs

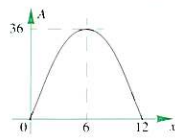
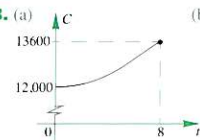
EXERCISE 9.1.2

1. (a) i. $100 - 2x$ ii. $0 < x < 50$ [Nb: if $x = 0$ or 50 , $A = 0$ and so there is no enclosure]

(b) i. $A = 2x(50 - x)$, $0 < x < 50$ ii. 10m by 80m or 40m by 20m iii. 1250 m^2 iv. 25m by 50 m

2. (a) ii. $0 < x < 12$ (b) i. 20 m^2 ii. 32 m^2 iii. 32 m^2 (c) (d) 6 m by 6 m

3. (a) (b) \$12,900

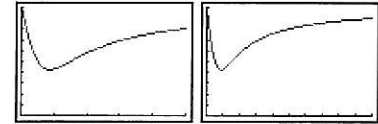


4. (a) $R(x) = xp = x(40 - 0.0004x)$, $0 \leq x \leq 100,000$ (b) i. \$960,000 ii. 18377 or 81622 [must be integer values] iii. 1,000,000

5. (a) $y = \frac{4}{3}(50 - x)$ (b) i. $A = \frac{8}{3}x(50 - x)$ ii. $0 < x < 50$ (c) i. $\frac{5000}{3} \text{ m}^2$

ii. $x = 25$, $y = \frac{200}{3}$; dimensions 50 m by $\frac{100}{3}$ m. 6. 35.83 kmh^{-1} 7. (a) 100%

(b) $t = 0.229$ (first time) then again at $t = 13.104$ (c) (d) i. 42.26% ii. 1.73 weeks

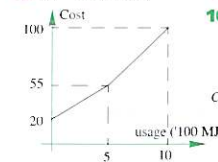


[0, 10] by [0, 1]

[0, 20] by [0, 1]

(e) As time increases, oxygen level will be 100%

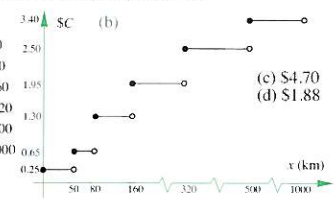
8. (a) (b) \$95.26



9. B(3254, 1953), C(6146, 3687) units in metres

10. (a)

$$C = \begin{cases} 0.25, & 0 \leq x < 50 \\ 0.65, & 50 \leq x < 80 \\ 1.30, & 80 \leq x < 160 \\ 1.95, & 160 \leq x < 320 \\ 2.50, & 320 \leq x < 500 \\ 3.40, & 500 \leq x < 1000 \end{cases}$$



(c) \$4.70
(d) \$1.88

11. (a) $0 < x < 4$ (b) $A(x) = 3x + 0.25x^2$, $0 < x < 4$

12. (a) i. 200 m ii. 320 m

(b) i. 0.34 sec and 11.66 sec ii. 11, 31 sec

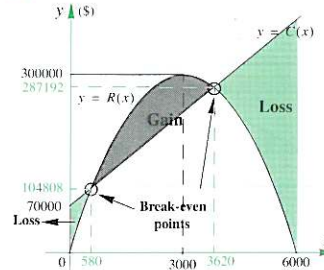
(d) 360 m

13. (a) 0.53 sec (on the way up) and 9.47 sec (on the way down)

(b) 10 sec (c) 500 m (d) 12.07 sec (e) 750 m

14. (a) \$72500 (b) No. (Loss of \$20000) (c) 2500

15. (a)



(b) i. \$70,000 ii. \$300,000
(c) Fixed cost (e.g., salary, electricity, ...)

(d) See graph in (a)

(e) \$76667 (to nearest dollar)

(f) i. $P(x) = 140x - \frac{1}{30}x^2 - 70000$, $0 \leq x \leq 6000$

ii. \$77,000 iii. 2100

(g) i. $0 \leq x \leq 580$ or $3620 \leq x \leq 6000$

ii. $581 < x < 3619$

(h) See graph in (a)

16. (b) i. $P(x) = -\frac{1}{30}x^2 + 194x - 72000$ ii. $0 \leq x \leq 6000$