Fully-Worked Solutions

CHAPTER 8 Graphs of Functions

UPSKILL 8.1

1 (a) (i) $5 - 5 = 0$
(ii) $10 - 5 = 5$

(b) (i) $5 \times 3 + 4 = 19$
(ii) $10 \times 3 + 4 = 34$

(c) (i) $5 \div 5 - 1 + 2 = 2$
(ii) $10 \div 5 - 1 + 2 = 3$

2 (a) Domain = {64, 25, 16}

(b) Codomain = {8, 5, 4}

(c) Objects = 64, 25, 16

(d) Images = 8, 5, 4

(e) Range = {8, 5, 4}

3 (a) Function

(b) Not a function

(c) Function

(d) Not a function

4

x	2	4	6	8
y	26	22	18	14

Yes, the relation between the number of days Aziana takes the vitamin and the remaining number of tablets in the bottle represents a function.

5 (a) $x = 4$, $f(4) = 2(4) - 3 = 5$

(b) $x = 0$, $f(0) = 2(0) - 3 = -3$

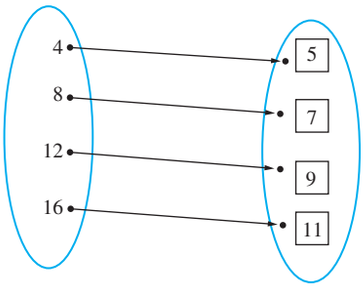
(c) $x = -5$, $f(-5) = 2(-5) - 3 = -13$

6 (a) $x = 4$, $y = \frac{1}{2}(4) + 3 = 5$

$x = 8$, $y = \frac{1}{2}(8) + 3 = 7$

$x = 12$, $y = \frac{1}{2}(12) + 3 = 9$

$x = 16$, $y = \frac{1}{2}(16) + 3 = 11$



(b) (i)

x	4	8	12	16
y	5	7	9	11

(ii) Ordered pair: {(4, 5), (8, 7), (12, 9), (16, 11)}

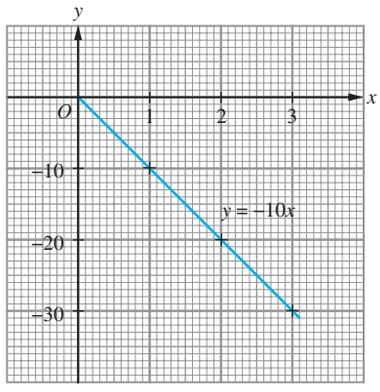
7 (a) $A(-2, -8)$, $B(-1, -5)$, $C(1, 1)$, $D(2, 4)$, $E(3, 7)$

(b) Yes, the relation between the x-coordinates and the y-coordinates of the points on the straight line represent a function.

UPSKILL 8.2

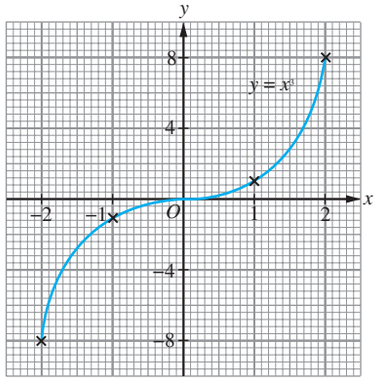
1 (a) $y = -10x$

x	1	2	3
y	−10	−20	−30



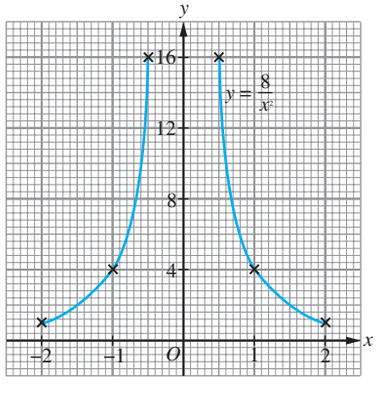
(b) $y = x^3$

x	−2	−1	0	1	2
y	−8	−1	0	1	8



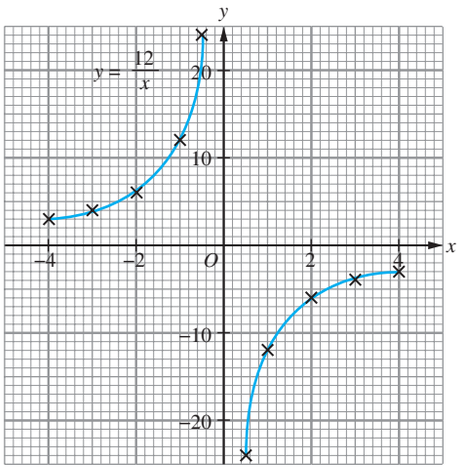
(c) $y = \frac{4}{x^2}$

x	−2	−1	−0.5	0	0.5	1	2
y	1	4	16	∞	16	4	1



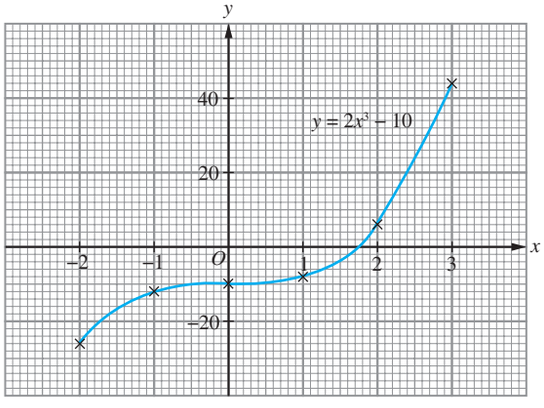
2

x	−4	−3	−2	−1	−0.5	0	0.5	1	2	3	4
y	3	4	6	12	24	∞	−24	−12	−6	−4	−3

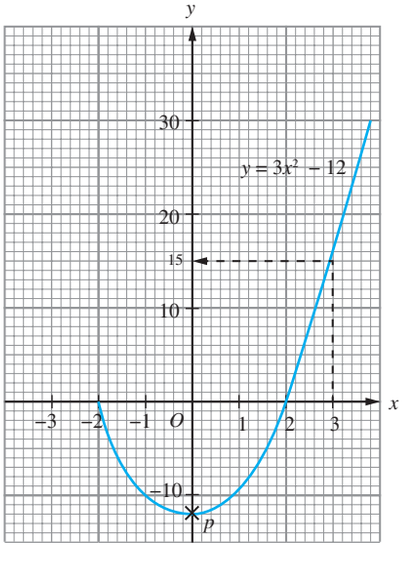


3

x	−2	−1	0	1	2	3
y	−26	−12	−10	−8	6	44

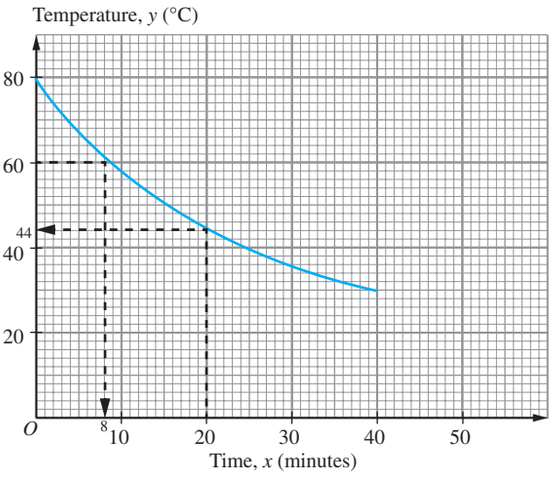


4



(a) 15
(b) −2, 2
(c) The minimum value of the function y is at point P, that is, when $x = 0$. The minimum value of y is −12.

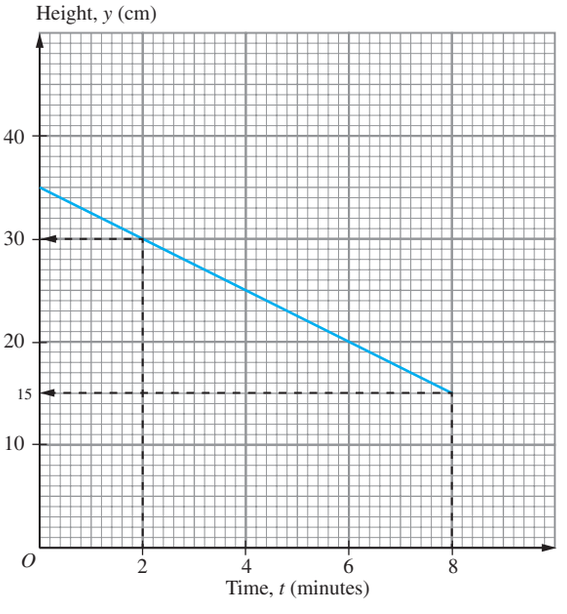
5 (a) No
(b) 80 °C
(c) 44 °C
(d)



8 minutes

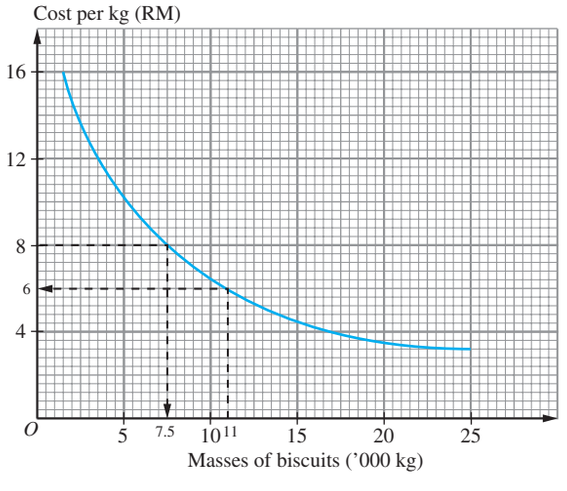
(e) No, the room temperature is more than 10 °C.

6 (a) 35 cm



(b) 30 cm
(c) $15 \times 30 \times 60 = 27\,000\ \text{cm}^3$
(d) 10 minutes

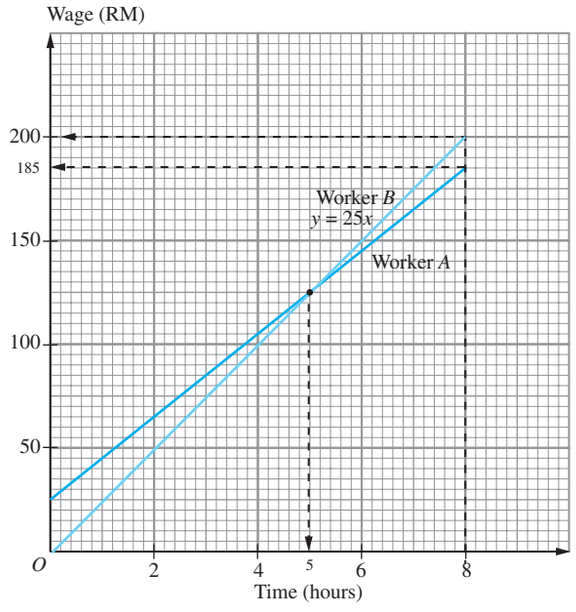
7 (a) The average cost to produce one kilogram of biscuits decreases when the mass of biscuits produced increases.



(b) $7.5 \times 1\,000 = 7\,500$ kg
(c) RM6

8 (a) $y = 25x$

x	0	2	4	6	8
y	0	50	100	150	200



(b) 5 hours

(c) RM200 − RM185 = RM15

Summative Practice 8

Section A

1 **A** Not a function
B Many-to-many function
C One-to-many function
D Many-to-one function
Answer: **D**

2 **A** Many-to-one function
B Many-to-many function
C One-to-one function
D One-to-many function
Answer: **C**

3 $16 = 3(3)^3 - 3k - 8$
$3k = 81 - 8 - 16$
$k = \frac{57}{3} = 19$
Answer: **C**

4 **A** $y = x + 1$
$(-1, 2)$: $y = -1 + 1$
$y = 0$
$\neq 2$
$(-1, 2)$ does not satisfy the function $y = x + 1$

B $y = 3 - x$
$(-1, 2)$: $y = 3 - (-1)$
$y = 4$
$\neq 2$
$(-1, 2)$ does not satisfy the function $y = 3 - x$

C $y = x + 3$
$(-1, 2)$: $y = -1 + 3$
$y = 2$
$(0, 1)$: $y = 0 + 3$
$y = 3$
$(0, 1)$ does not satisfy the function $y = x + 3$

D $y = x^2 + 1$
$(-1, 2)$: $y = (-1)^2 + 1$
$y = 2$
$(0, 1)$: $y = 0 + 1$
$y = 1$
$(1, 2)$: $y = (1)^2 + 1$
$y = 2$
$(2, 5)$: $y = (2)^2 + 1$
$y = 5$
Answer: **D**

5 $\frac{3}{2} = \frac{6}{p}$
$p = 4$
Answer: **A**

6 $n = 2(-3) - \frac{1}{9}(-3)^3 + 5$
$= -6 + 3 + 5$
$= 2$
Answer: **A**

7 $6 = 2m^2 + m$
$2m^2 + m - 6 = 0$
$(2m - 3)(m + 2) = 0$
$m = \frac{3}{2}, -2$
Answer: **C**

8 $f(x) = (x + 2)(x - 5)$
When $x = 0$, $y = h$
$h = (0 + 2)(0 - 5)$
$= -10$
Answer: **C**

9 From the graph, when $x = -4$, $y = 0$
Answer: **B**

10 y is maximum when $x = -2$
Answer: **A**

Section B

1 (a) $y = 24 - 3x$
$= 24 - 3(2)$
$= 18$
$(2, 18)$ ✓

(b) $y = 24 - 3x$
$= 24 - 3(0)$
$= 24$
$(6, 6)$ ✗

(c) $y = 24 - 3x$
$= 24 - 3(6)$
$= 6$
$(0, 21)$ ✓

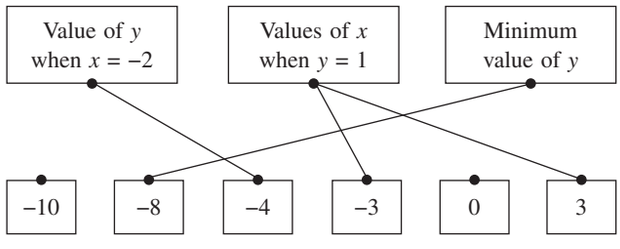
(d) $y = 24 - 3x$
$= 24 - 3(3)$
$= 15$
$(3, 17)$ ✗

2 (a) (i) Not a function (ii) Many-to-one function

(b) $y = px - 3$
$1 = p(1) - 3$
$p = 4$

$y = px - 3$
$9 = 4q - 3$
$4q = 12$
$q = 3$

3



4 (a) $y = -(-2)^2 - 4(-2) - 4$
$= -4 + 8 - 4$
$= 0$
$\therefore (-2, 0)$ lies on the graph

(b) $f(-3) = -(-3)^2 - 4(-3) - 4$
$= -9 + 12 - 4$
$= -1$

(c) $f(2) = -(2)^2 - 4(2) - 4$
$= -4 - 8 - 4$
$= -16$
$f(-6) = -(-6)^2 - 4(-6) - 4$
$= -36 + 24 - 4$
$= -16$
$\therefore f(2) = f(-6)$

(d) From part (c), it is a many-to-one function

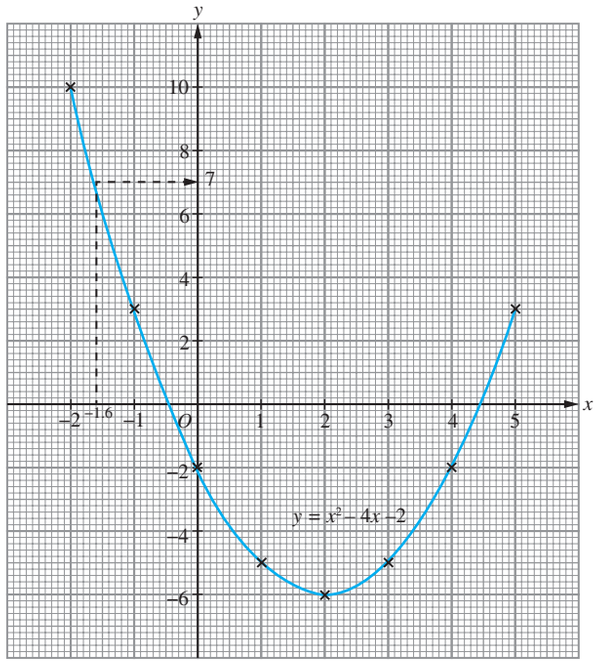
	Statements	TRUE or FALSE
(a)	The point on the x-axis where $x = -2$ lies on the graph of the function.	TRUE
(b)	The value of $f(-3)$ is 1.	FALSE
(c)	The values of $f(2)$ and $f(-6)$ are equal.	TRUE
(d)	The function is a one-to-one function.	FALSE

Section C

1 (a)

x	−2	−1	0	1	2	3	4	5
y	10	3	−2	−5	−6	−5	−2	3

(b)



(c) (i) $y = 7$

(ii) $x = -0.45, 0.45$

2 (a) (i) $\{(2, 6), (3, 9), (5, 15)\}$

(ii) $q = 3p$

(b) $1 = -a + c$ … ①
$7 = 2a + c$ … ②
② − ①: $6 = 3a$
$a = 2$
$1 = -2 + c$
$c = 3$
$k = 2(4) + 3 = 11$
$21 = 2m + 3$
$m = \frac{18}{2} = 9$

(c) (i) 50 m

(ii) 100 m

(iii) Anna, 10 s