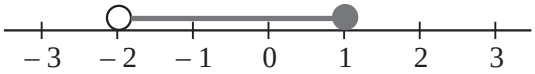
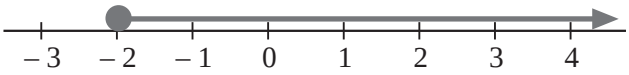
UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.1

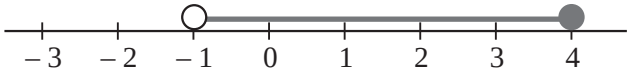
1. Use a diagram to illustrate each of the following inequalities:

   (a) $x > -1$ (b) $x \leq 3$ (c) $-3 \leq x < -1$

2. Write down the inequality represented by each of the following diagrams:

   (a)
   

   (b)
   

   (c)
   

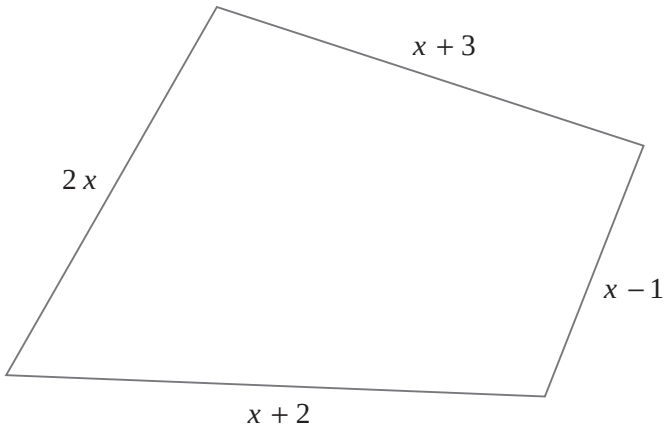
3. Solve each of the following inequalities:

   (a) $5x < 45$ (b) $3x + 2 \geq 32$ (c) $2x - 3 \geq 11$

   (d) $3x + 2 \leq 5$ (e) $2x + 6 \leq -10$ (f) $6 - 3x \geq -3$

   (g) $-5 < x + 2 \leq 3$ (h) $-1 \leq 2x + 1 \leq 15$ (i) $-9 < 3x + 6 < 15$

4. The perimeter of the quadrilateral shown is less than 40 cm but greater than 16 cm. Form and solve an inequality for x.



UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.2

1. (a) Draw the line which has gradient -2 and y-intercept 8.
   (b) Write down the equation of this line.

2. (a) Copy and complete the following table:

x	-3	-2	-1	0	1	2	3
$x^2 - 2x$							

   (b) Use your values to draw the curve with equation $y = x^2 - 2x$.

3. Using the same axes,
   (a) draw the graph $y = \frac{1}{2}x^2$, for $-4 \le x \le 4$,
   (b) sketch the curve with equation $y = \frac{1}{2}x^2 + 2$,
   (c) sketch the curve with equation $y = \frac{1}{2}x^2 - 3$.

4. (a) Draw the curves with equations $y = x^2 + 2x + 1$ and $y = x^2 - 6x + 9$.
   (b) Describe the relationship between the two curves.

UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.3

1. (a) Copy and complete the following table:

x	-3	-2	-1	0	1	2	3
$\frac{1}{2}x^3 - 2x$							

(b) Use the values in the table to draw the curve with equation $y = \frac{1}{2}x^3 - 2x$.

(c) On the same set of axes, draw the curve with equation $y = \frac{1}{2}x^3 - 2x + 2$.

2. (a) Copy and complete the following table:

x	-6	-3	-2	-1	1	2	3	6
$\frac{12}{x}$								

(b) Use the table to draw the curve with equation $y = \frac{12}{x}$.

3. Use suitable graphs to determine the coordinates of the points where the curve $y = \frac{16}{x}$ intersects the curve with equation $y = x^3$.

UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.4

1. Use a graph to find the two solutions of the equation

$$x^2 - 3x = 4$$

2. The equation

$$x^3 - x = 1000$$

has a solution close to $x = 10$.

Determine this solution of the equation, correct to 4 significant figures.

3. Use the trial and improvement method to solve the equation

$$x^3 = 12$$

correct to 2 decimal places.

4. The equation

$$3x - \frac{1}{x} = 4$$

has a solution close to $x = 1$.

Determine this solution of the equation, correct to 2 decimal places.

UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.5

1. Use a graph to solve the inequalities,

   (a) $x^2 - x \geq 6$ (b) $x^2 - x < 6$

2. Solve the following inequalities:

   (a) $x^2 - 3x < 0$ (b) $x^2 \geq 4x$

   (c) $x^2 + 8x \leq 0$ (d) $x^2 \leq 5x$

3. Solve the following inequalities:

   (a) $x^2 \leq 64$ (b) $x^2 > 100$

   (c) $x^2 \leq 16$ (d) $3x^2 - 75 \leq 0$

4. Solve the following inequalities:

   (a) $x^2 + 4x - 21 > 0$ (b) $x^2 + 10x + 16 \leq 0$

   (c) $x^2 - 3x \geq 10$ (d) $x^2 - 4x - 21 \leq 0$

   (e) $x^2 + x \leq 20$ (f) $x^2 - 9 \geq 8x$

UNIT 13 *Graphs, Equations and Inequalities* — Extra Exercises 13.6

1. (a) Draw the line with equation $y = 3x$.

   (b) Draw a line that is perpendicular to $y = 3x$ and that passes through the origin.

   (c) Determine the equation of the perpendicular line.

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2. The equations of 6 lines are given below:

   A $y = -5x + 2$

   B $y = 3x + \frac{1}{2}$

   C $y = -\frac{1}{3}x - 2$

   D $y = 2x - \frac{1}{5}$

   E $y = \frac{1}{5}x - 2$

   F $y = \frac{1}{5}x - \frac{1}{2}$

   (a) Which line is perpendicular to B ?

   (b) Which lines are perpendicular to A ?

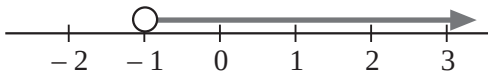
   (c) Which lines are parallel?

3. Determine the equation of the line that is perpendicular to $y = 2x$ and passes through the point with coordinates $(4,\ 8)$.

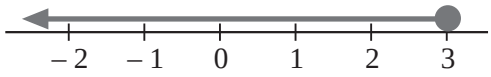
4. Determine the equation of the line that is perpendicular to $y = 8 - 3x$ and passes through the point with coordinates $(2,\ 2)$.

Extra Exercises 13.1 Answers

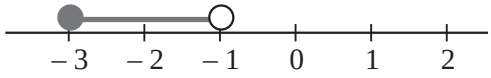
1. (a)



(b)



(c)



2. (a) $-2 < x \leq 1$ (b) $x \geq -2$ (c) $-1 < x \leq 4$

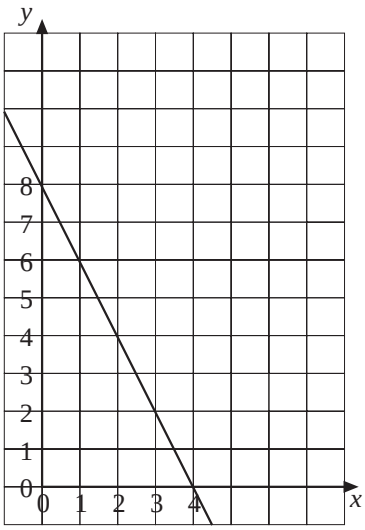
3. (a) $x < 9$ (b) $x \geq 10$ (c) $x \geq 7$
   (d) $x \leq 1$ (e) $x \leq -8$ (f) $x \leq 3$
   (g) $-7 < x \leq 1$ (h) $-1 \leq x \leq 7$ (i) $-5 < x < 3$

4. $16 < 5x + 4 < 40$

   $2.4 < x < 7.2$

Extra Exercises 13.2 Answers

1. (a)



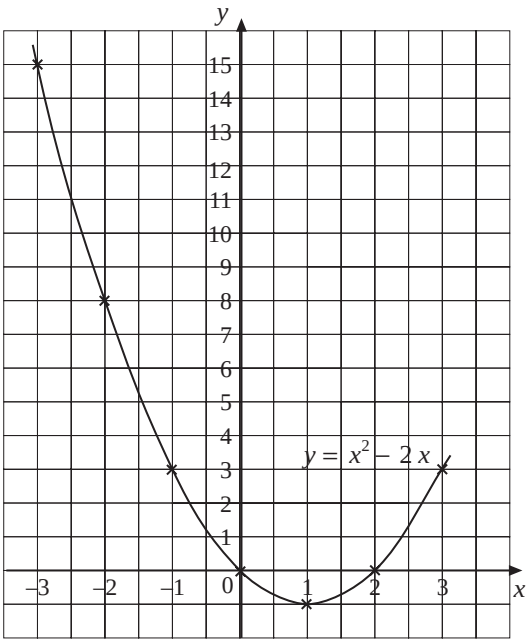
(b) $y = 8 - 2x$

2. (a)

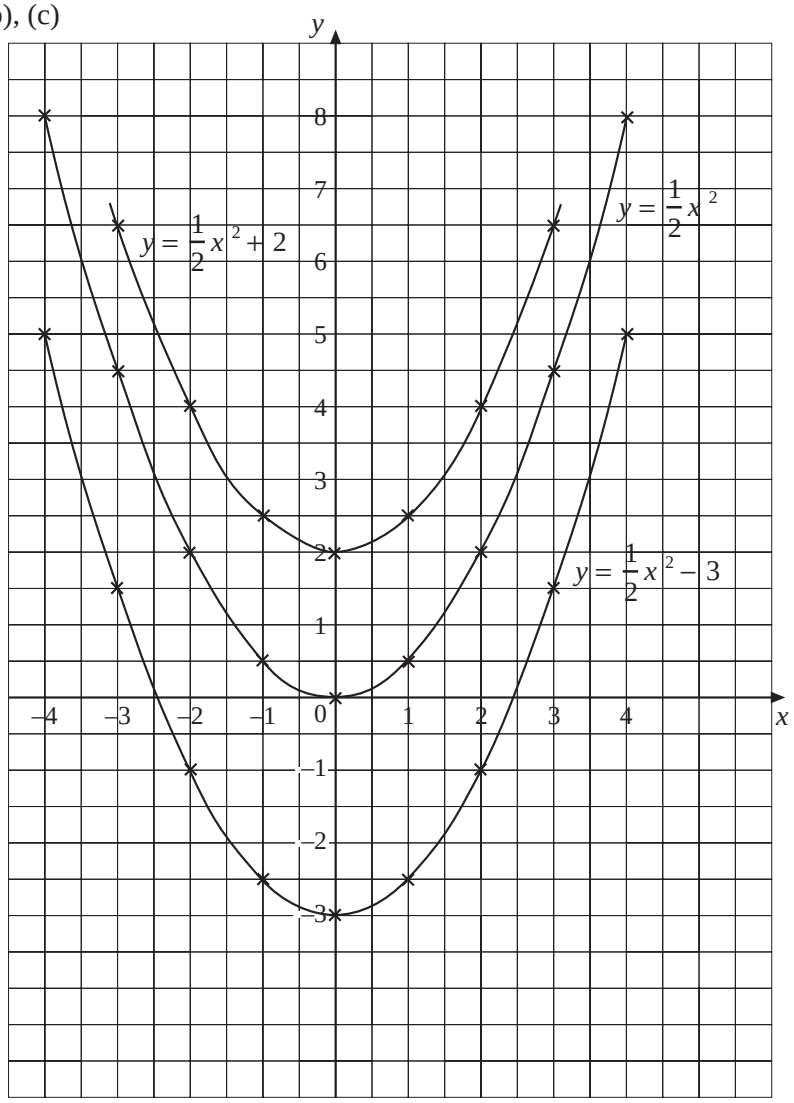
x	-3	-2	-1	0	1	2	3
$x^2 - 2x$	15	8	3	0	-1	0	3

Extra Exercises 13.2 Answers (continued)

2. (b)

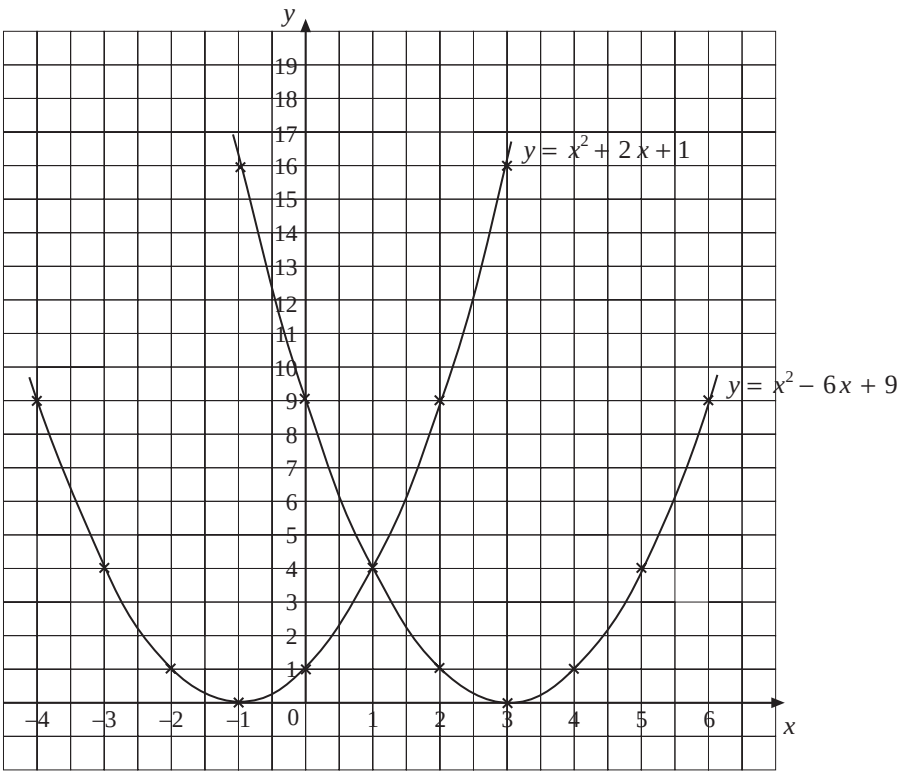


3. (a), (b), (c)



Extra Exercises 13.2 Answers (continued)

4. (a)



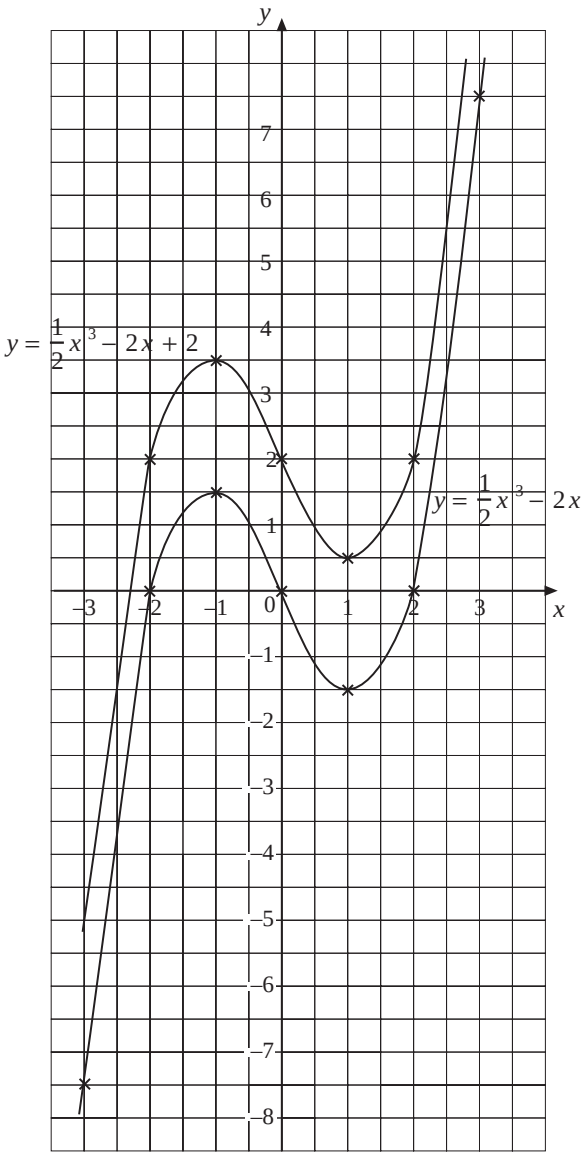
(b) Horizontal translation of 4 units moves one on to the other.

Extra Exercises 13.3 Answers

1. (a)

x	-3	-2	-1	0	1	2	3
$\frac{1}{2}x^3 - 2x$	-7.5	0	1.5	0	-1.5	0	7.5

(b), (c)

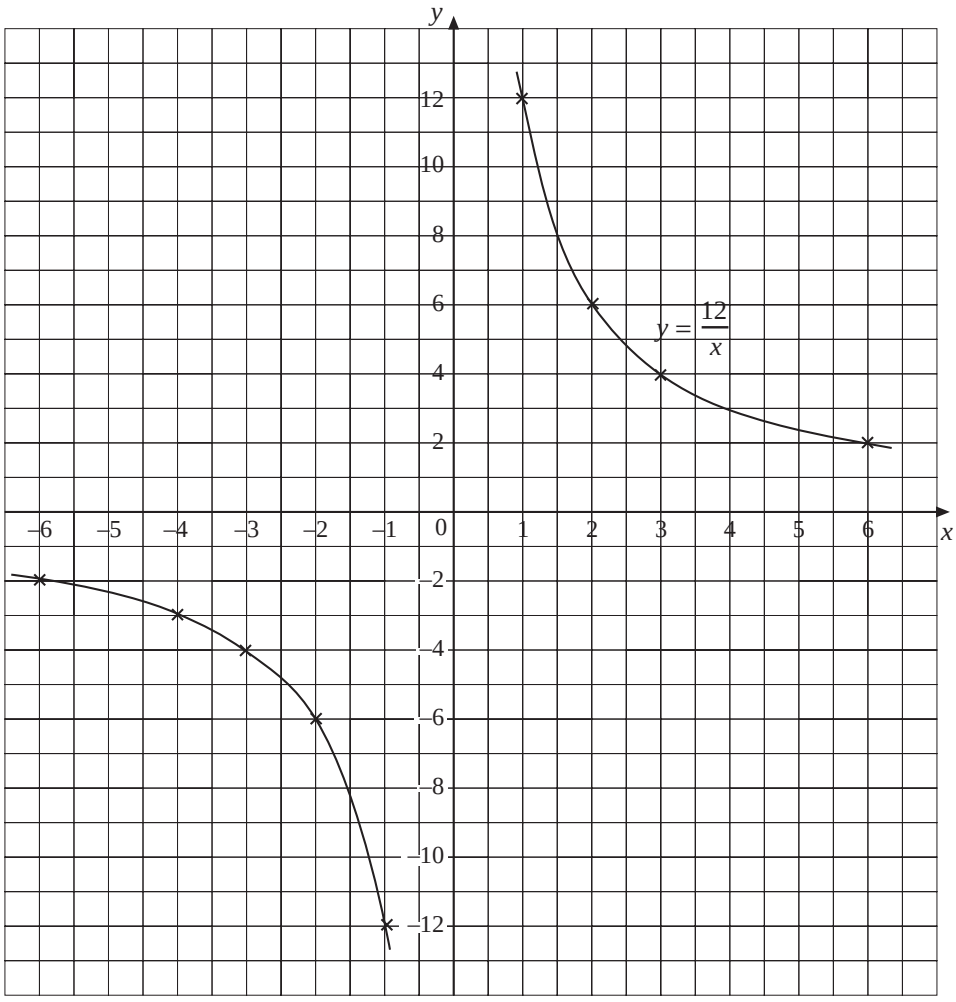


2. (a)

x	-6	-3	-2	-1	1	2	3	6
$\frac{12}{x}$	-2	-4	-6	-12	12	6	4	2

Extra Exercises 13.3 Answers (continued)

2. (b)



3. $(-2, -8)$, $(2, 8)$

Extra Exercises 13.4 Answers

1. $x = 4$ or $x = -1$
2. 10.03
3. 2.29
4. $x = 1.55$

Extra Exercises 13.5 Answers

1. (a) $x \geq 3$ or $x \leq -2$ (b) $-2 < x < 3$

2. (a) $0 < x < 3$ (b) $x \leq 0$ or $x \geq 4$ (c) $-8 \leq x \leq 0$ (d) $0 \leq x \leq 5$

3. (a) $-8 \leq x \leq 8$ (b) $x < -10$ or $x > 10$ (c) $-4 \leq x \leq 4$ (d) $-5 \leq x \leq 5$

4. (a) $x < -7$ or $x > 3$ (b) $-8 \leq x \leq -2$ (c) $x \leq -2$ or $x \geq 5$
   (d) $-3 \leq x \leq 7$ (e) $-5 \leq x \leq 4$ (f) $x \leq -1$ or $x \geq 9$

Extra Exercises 13.6 Answers

1. (c) $y = -\frac{1}{3}x$

2. (a) C (b) E and F (c) E and F

3. $y = -\frac{1}{2}x + 10$

4. $y = \frac{1}{3}x + \frac{4}{3}$