

UNIT 29 *Using Graphs to Solve Equations*

CSEC Revision Test

1. Shelly buys 3 litres of oil and 40 litres of gasoline for \$30.

The cost of one litre of oil is \$ x and the cost of one litre of gasoline is \$ y .

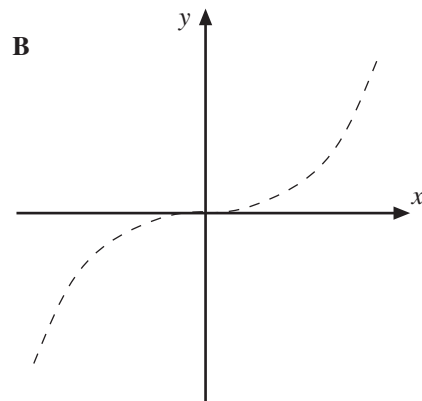
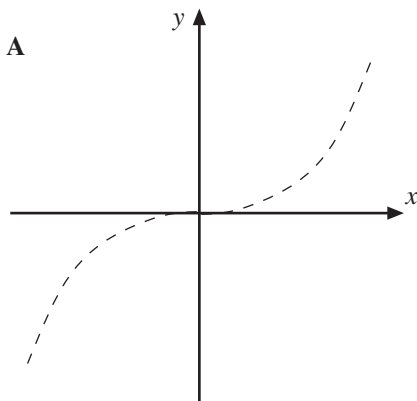
- (a) Explain why the cost of Shelly's purchases is given by the equation:

$$3x + 40y = 30 \quad (1 \text{ mark})$$

Craig buys 2 litres of oil and 10 litres of gasoline for his motorbike for \$10.

- (b) Write down the equation for Craig's purchases. (1 mark)
- (c) Plot these two equations on graph paper like that shown on the next page. (3 marks)
- (d) By using your graph, or otherwise, find:
- (i) the cost of one litre of oil, (1 mark)
- (ii) the cost of one litre of gasoline. (1 mark)

2. The dotted lines on the diagram below show part of the graph of $y = x^3$.

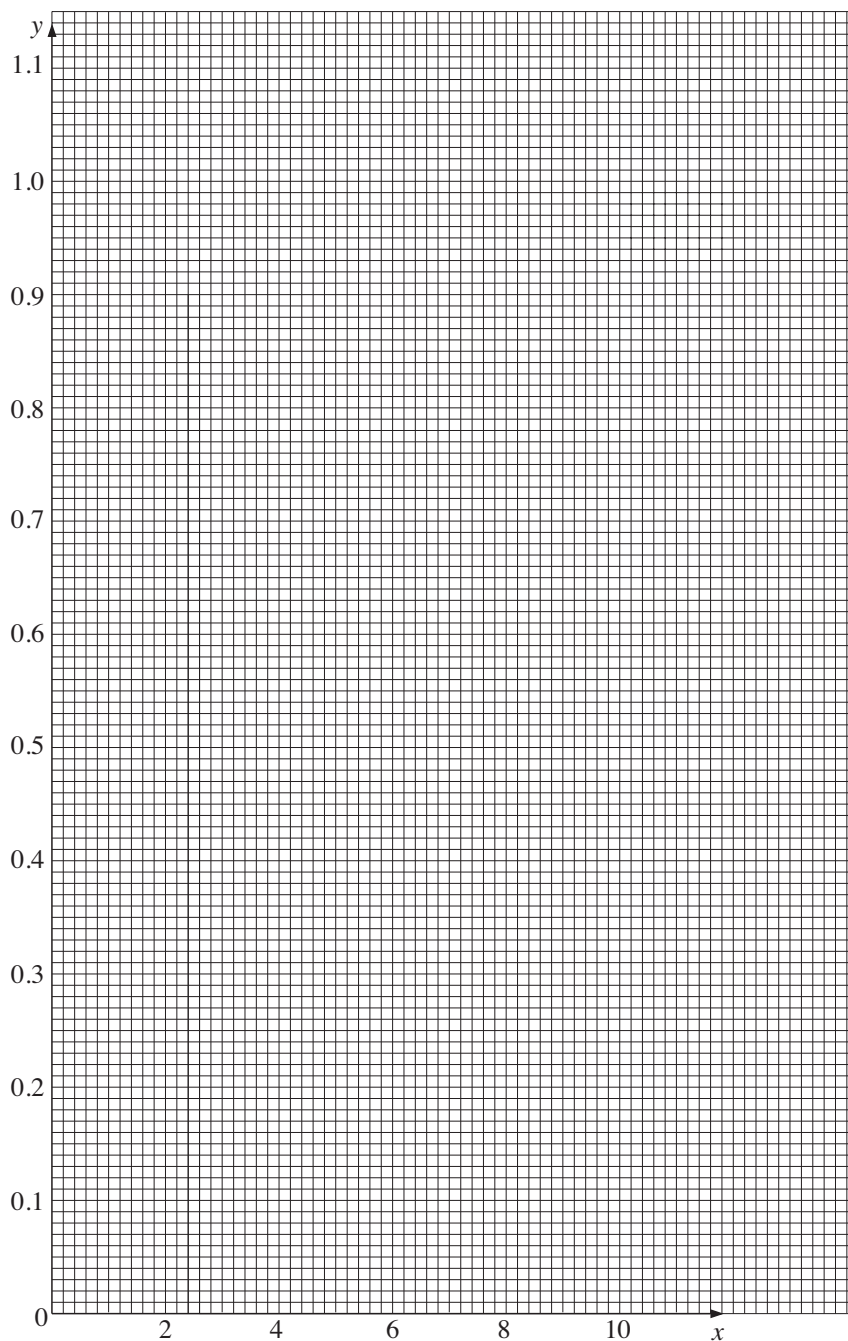


- (a) On a copy of diagram A, sketch the graph of $y = x^3 + 1$. (2 marks)
- (b) On a copy of diagram B, sketch the graph of $y = -x^3$. (2 marks)

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Graph paper for Question 1



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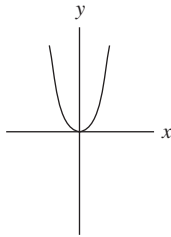
3. The four sketch graphs below each represent one of the following functions.

$$y = \frac{2}{x}$$

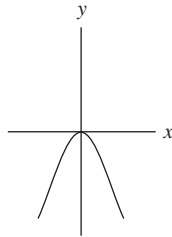
$$y = 2x^2$$

$$y + \frac{2}{x} = 0$$

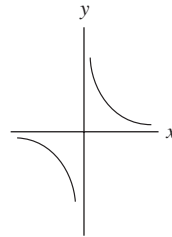
$$y = -x^2$$



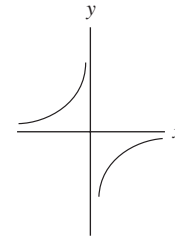
Graph A



Graph B



Graph C



Graph D

- (a) Copy and complete the table to show which graph represents which function.

<i>GRAPH</i>	<i>FUNCTION</i>
A	
B	
C	
D	

(4 marks)

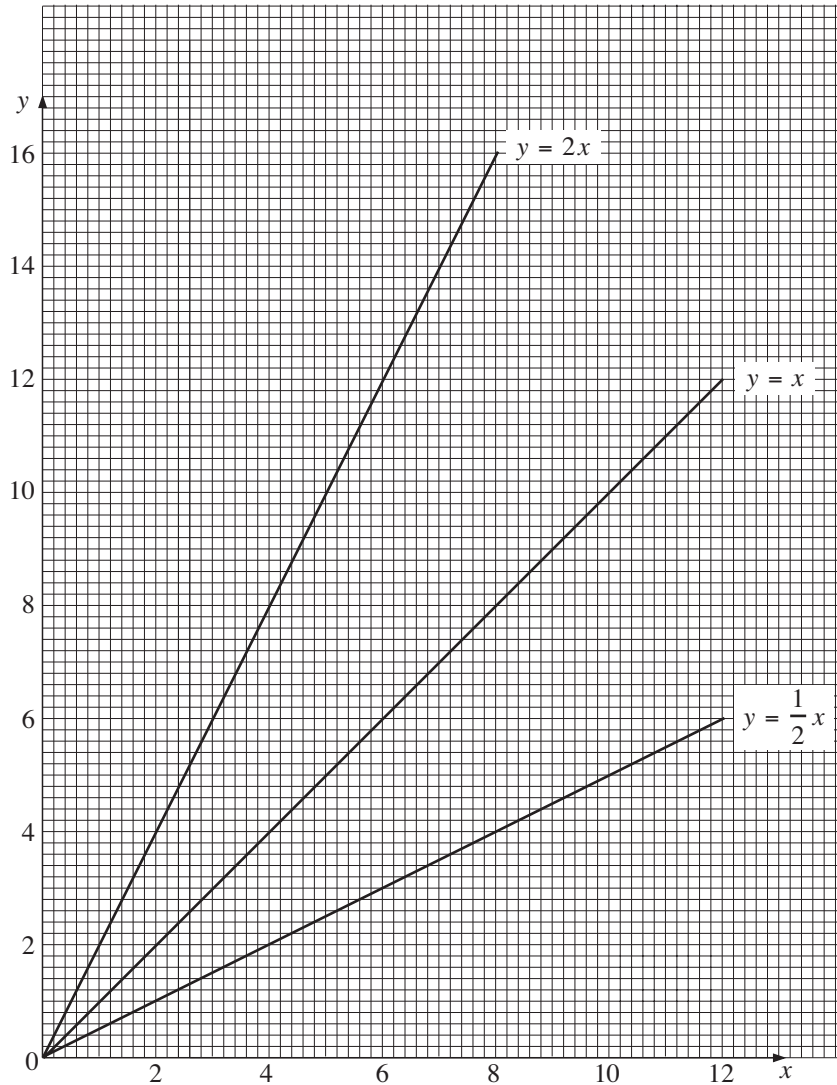
The line $y = x$ will intersect three of the four graphs in two places.

- (b) State which graph does not intersect the line $y = x$. (1 mark)
- (c) State the coordinates of the points of intersection of $y = x$ with each of the other graphs. (6 marks)

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4.



(a) The graphs of the lines $y = x$, $y = 2x$ and $y = \frac{1}{2}x$ have been drawn.

What is the gradient of the line $y = x$?

(1 mark)

(b) A rectangle has dimensions x cm by y cm.

It has an area of 8 cm^2 .

(i) Complete the table to show some possible values of x and y , where $y = \frac{8}{x}$.

x	0.8	1	2	4	5	8	10
y		8	4	2		1	

(2 marks)

(ii) Plot these points on a copy of the axes above and draw the graph of $y = \frac{8}{x}$.

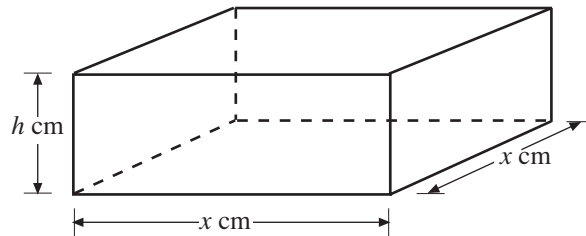
(3 marks)

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- (iii) A rectangle has an area of 8 cm^2 . The length y of the rectangle is twice the width x .
Mark a point on the graph where the dimensions of the rectangle can be found. Label it A. (1 mark)
- (iv) A square has an area of 8 cm^2 . Mark a point on the graph where the length of the side of the square can be found. Label it B. (1 mark)

5. *Graph paper must be used for this question.*



A rectangular block has a square base of side $x \text{ cm}$ and a height of $h \text{ cm}$. The total surface area of the block is 72 cm^2 .

- (a) Express h in terms of x . (2 marks)
- (b) Show that the volume, $V \text{ cm}^3$, of the block is given by

$$V = 18x - \frac{1}{2}x^3 \quad (2 \text{ marks})$$

- (c) Copy and complete the following table to show corresponding values of x and V .

x	0	1	2	3	4	5	6
V	0			40.5	40		0

(2 marks)

- (d) Using a scale of 2 cm to represent 1 unit on the x -axis and 2 cm to represent 10 units on the V -axis, draw the graph of $V = 18x - \frac{1}{2}x^3$ for values of x from 0 to 6 inclusive. (3 marks)
- (e) A block of this type has a volume of 30 cm^3 . Given that $h > x$, find the dimensions of the block. (2 marks)

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6. (a) The grid shows the line, l , which passes through the points $A(-1, -2)$ and $B(2, 4)$.
- (i) Determine the gradient of the line, l . (2 marks)
- (ii) Write down the equation of the line, l . (1 mark)
- (b) (i) Given that $f(x) = 3 - x^2$, copy and complete the table below for $-3 \leq x \leq 2$.

x	-3	-2	-1	0	1	2
$f(x)$	-6		2			-1

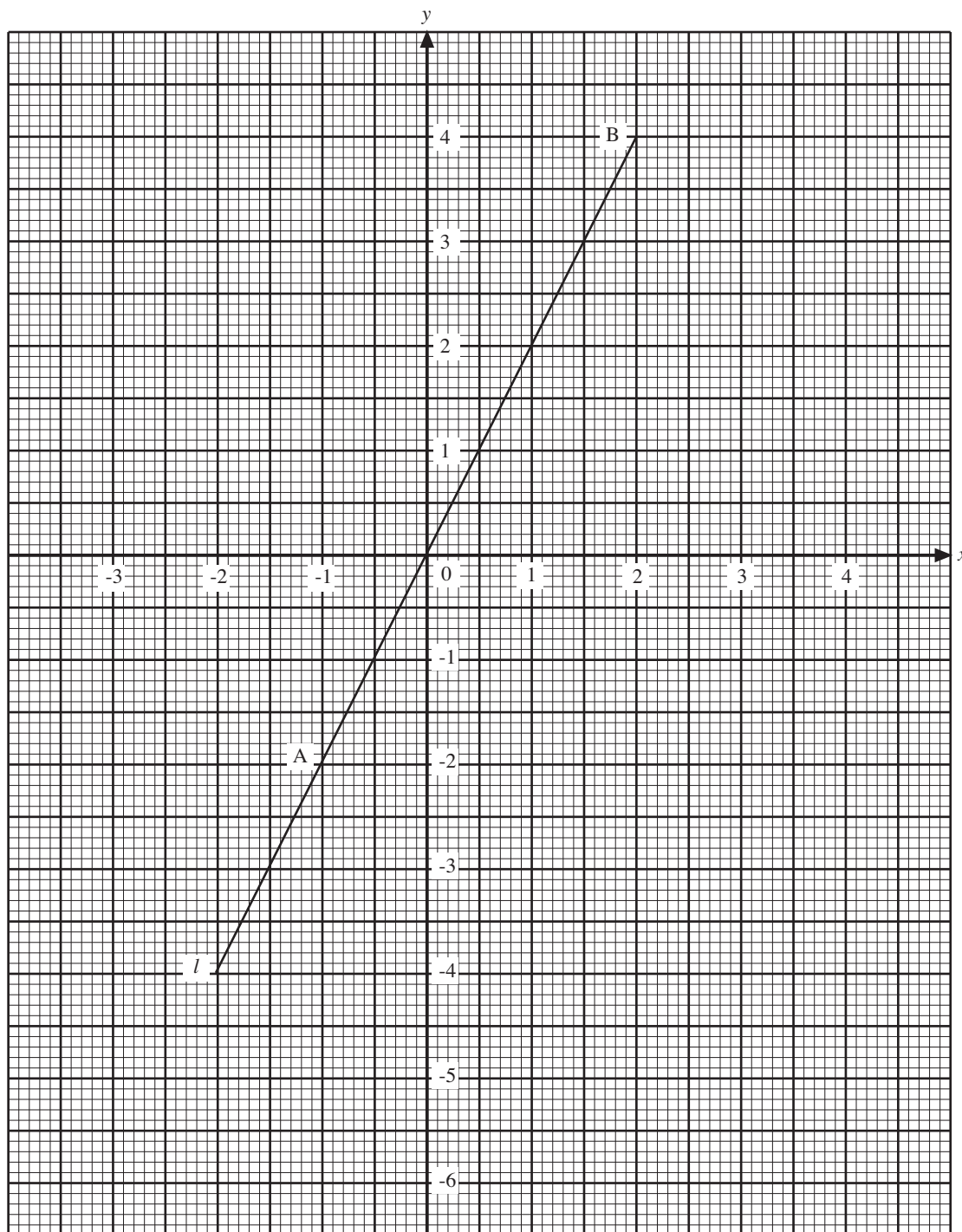
(2 marks)

- (ii) On a copy of the following grid, draw the graph of $f(x) = 3 - x^2$ for $-3 \leq x \leq 2$. (3 marks)
- (iii) Write down the coordinates of the points where the line, l , and the graph $f(x) = 3 - x^2$ intersect. (2 marks)

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6. (continued)



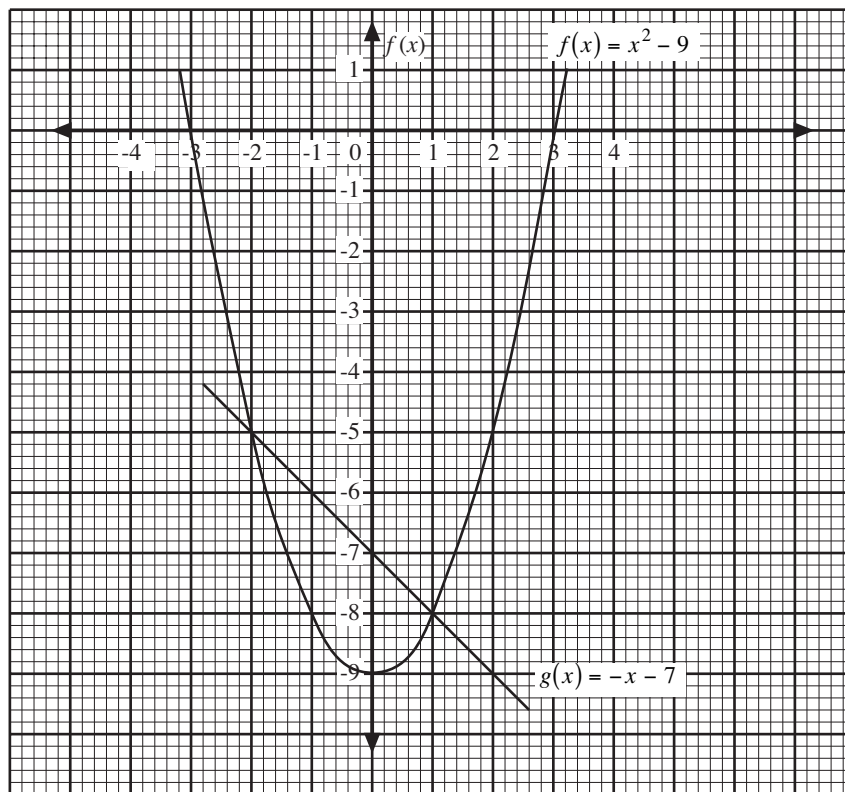
(CXC)

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7. The figure provided shows the graph of $f(x) = x^2 - 9$ for $-3 \leq x \leq 3$ and of the graph of $g(x) = -x - 7$

- (a) State the elements in the domain of $f(x)$ for which $f(x) = -5$. (2 marks)
- (b) Given that $f(x) = g(x)$, show that $x^2 + x - 2 = 0$. (2 marks)
- (c) Solve the equation $x^2 + x - 2 = 0$. (3 marks)



(CXC)

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8. An athlete runs on a track so that his distance, d metres, from the starting point after t seconds is as shown in the table below.

Time (seconds), t	0	2	4	6	8	10
Distance (metres), d	0	14	40	74	94	100

- (a) (i) Using a horizontal scale of 1 cm to represent 1 second and a vertical scale of 1 cm to represent 10 metres, construct a distance-time graph to show the motion of the athlete.
- (ii) Draw a smooth curve through all the plotted points.
- (b) Use your graph to estimate
- (i) the distance travelled by the athlete after 3 seconds
- (ii) the average speed of the athlete during the interval $t = 6$ seconds to $t = 8$ seconds.
- (iii) the speed of the athlete 6 seconds after leaving the starting point.

(10 marks)

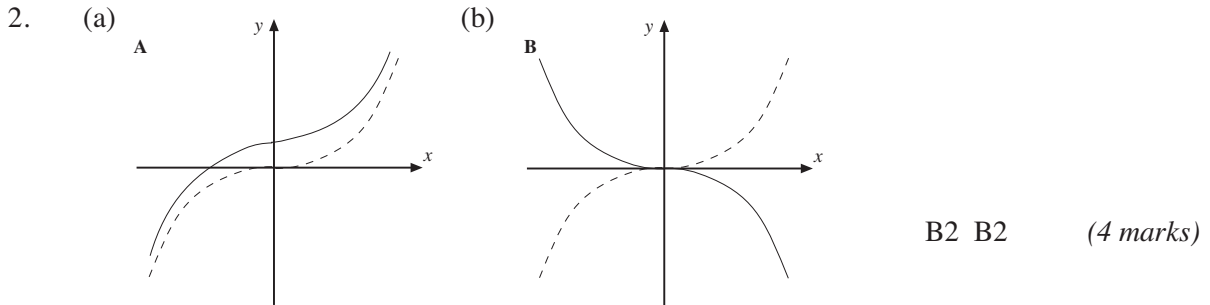
(CXC)

TOTAL MARKS: 68

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1. (a) Explanation (b) $2x + 10y = 10$ B1 B1
 (c) Graph B3
 (d) (i) \$2 (ii) 60 cents B1 B1 (7 marks)



3. (a)

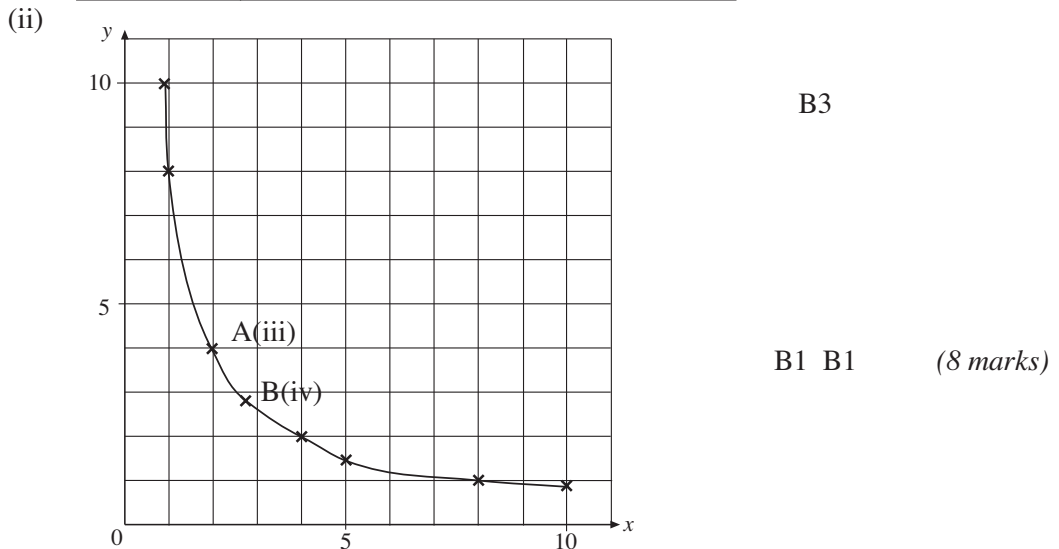
Graph	Function	
A	$y = 2x^2$	B1
B	$y = -x^2$	B1
C	$y = \frac{2}{x}$	B1
D	$y + \frac{2}{x} = 0$	B1
- (b) D B1
- (c) A: $(0, 0), (\frac{1}{2}, \frac{1}{2})$ B1 B1
 B: $(0, 0), (-1, -1)$ B1 B1
 C: $(\sqrt{2}, \sqrt{2}), (-\sqrt{2}, -\sqrt{2})$ B1 B1 (11 marks)

4. (a) 1 B1

(b) (i)

x	0.8	1	2	4	5	8	10
y	10	8	4	2	1.6	1	0.8

 B2



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5. (a) $h = \frac{36 - x^2}{2x} \left(= \frac{18}{x} - \frac{x}{2} \right)$ (b) $V = hx^2$ M1 A1 B2

(c)

x	0	1	2	3	4	5	6
V	0	17.5	32	40.5	40	27.5	0

B2

(d) Graph B3

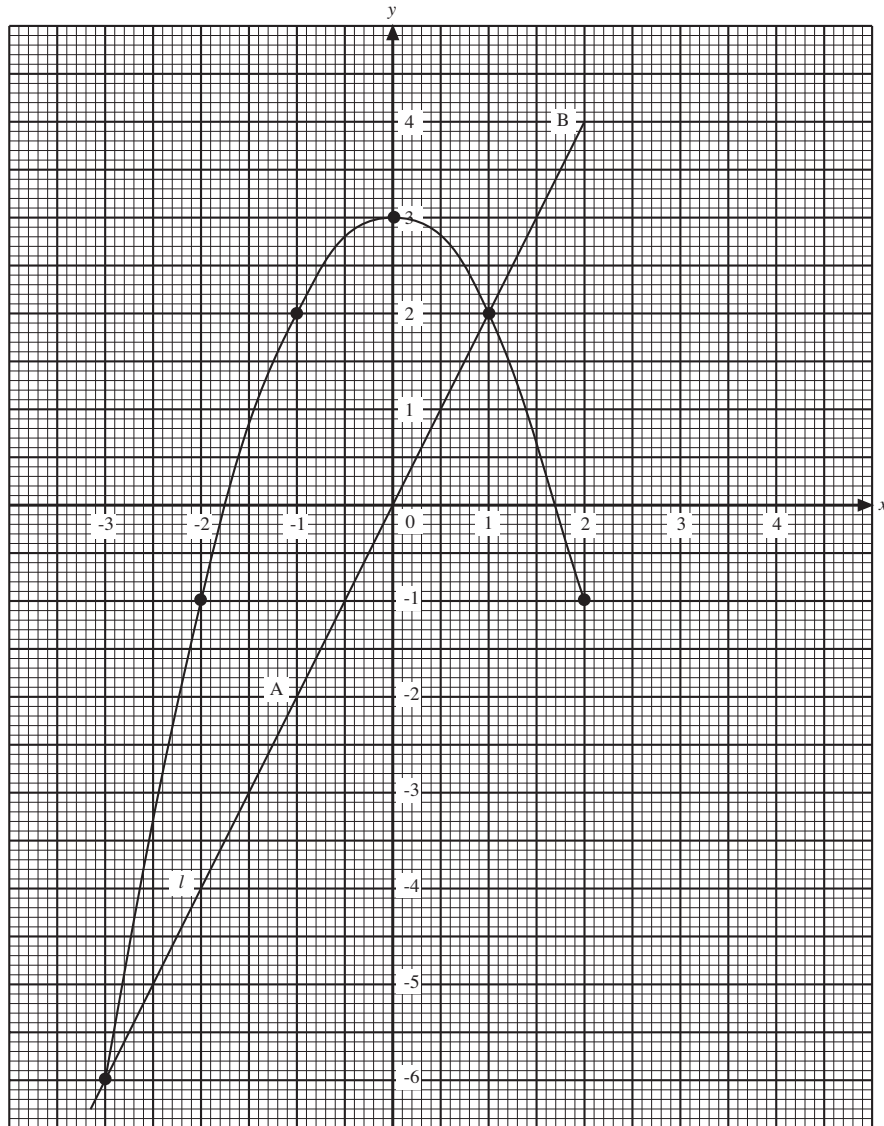
(e) 1.85 B2 (11 marks)

6. (a) (i) Gradient = $\frac{4 - (-2)}{2 - (-1)} = 2$ M1 A1

(ii) $y = 2x$ B1

(b) (i) $f(-2) = -1, f(0) = 3, f(1) = 2$ (-1 for each mistake) B2

(ii)



B3

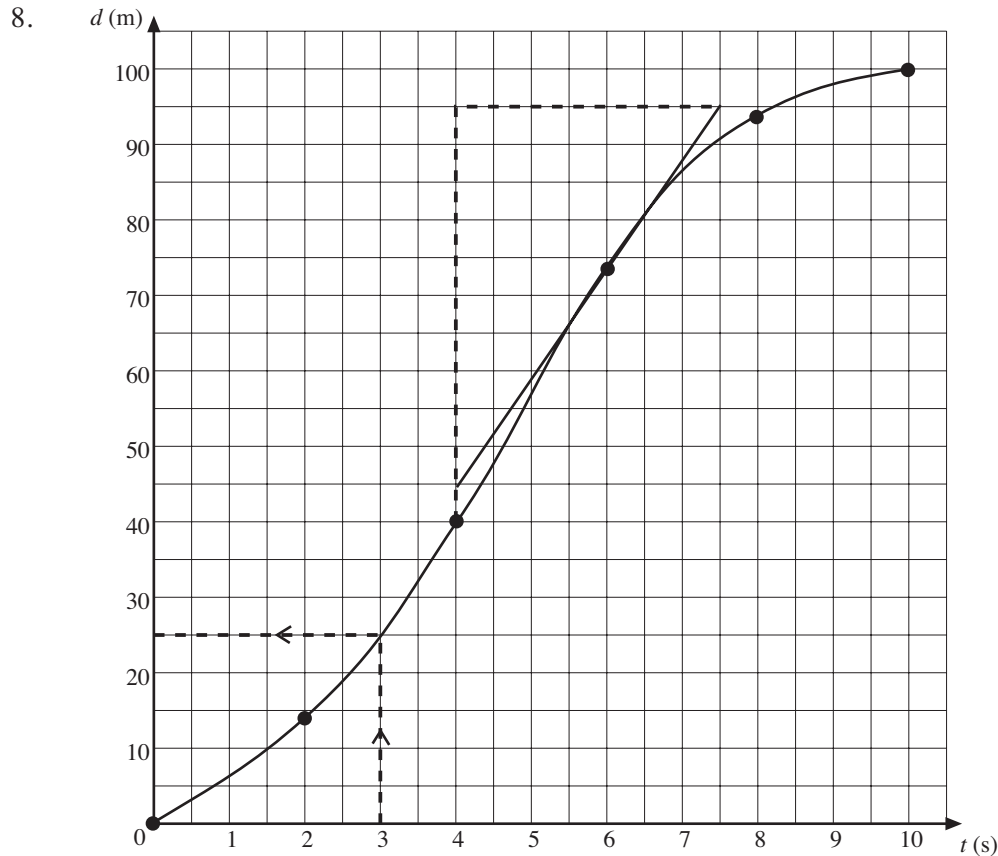
(iii) $(-3, -6)$ and $(1, 2)$

B1 B1 (10 marks)

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7. (a) $x = -2$ and $x = 2$ B1 B1
- (b) $x^2 - 9 = -x - 7 \Rightarrow x^2 + x - 2 = 0$ M1 A1
- (c) From graph, $x = -2$ and $x = 1$ M1 A1 A1 (7 marks)



- (a) (i) Axis B1
Points B2
- (ii) Curve B2
- (b) (i) 25 m B1
- (ii) Average speed = $\frac{\text{distance travelled}}{\text{time taken}} = \frac{94 - 74}{8 - 6} = 10 \text{ m/s}$ M1 A1
- (iii) Speed $\approx \frac{\text{increase in distance}}{\text{increase in time}} = \frac{95 - 45}{7.5 - 4} \approx 14.3 \text{ m/s}$ M1 A1

(10 marks)

TOTAL MARKS: 68