

Mark Scheme (Results)

January 2015

Pearson Edexcel Level 3 Award
in Algebra (AAL30)

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NOTES ON MARKING PRINCIPLES

1 **Types of mark**

M marks: method marks

A marks: accuracy marks

B marks: unconditional accuracy marks (independent of M marks)

2 **Abbreviations**

cao – correct answer only

isw – ignore subsequent working

oe – or equivalent (and appropriate)

indep - independent

ft – follow through

SC: special case

dep – dependent

3 **No working**

If no working is shown then correct answers normally score full marks

If no working is shown then incorrect (even though nearly correct) answers score no marks.

4 **With working**

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

5 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

6 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

7 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

8 Use of ranges for answers

If an answer is within a range this is inclusive, unless otherwise stated.

PAPER: AAL30_01

Question		Working	Answer	Mark	Notes
1	(a)		p^8	1	B1 cao
	(b)		$q^{\frac{5}{2}}$	1	B1 oe
	(c)		r^2	1	B1 cao
	(d)	$w^{-1}(w - w^{\frac{1}{3}})$	$1, -\frac{2}{3}$	3	M1 for method to enable simplification, eg $w^{-1}(w - w^{\frac{1}{3}})$ or $\frac{w}{w} - \frac{w^{\frac{1}{3}}}{w}$ A1 $a = 1$ A1 $b = -\frac{2}{3}$
2	(a)		$(x - 5)^2$	1	B1 for $(x - 5)^2$
	(b)		$9(1 - y)(1 + y)$	2	M1 for a correct but not full factorisation including two linear factors A1 for $9(1 - y)(1 + y)$
	(c)		$(v + 3)(t - 2)$	2	M1 for $t(v + 3)$ and $-2(v + 3)$ or $v(t - 2)$ and $3(t - 2)$ A1 for $(v + 3)(t - 2)$

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Question		Working	Answer	Mark	Notes
3	(a)	Gradient of L_1 is $-\frac{3}{4}$ $y = -\frac{3}{4}x + c$ $1 = -\frac{3}{4} \times 2 + c$ $c = \frac{10}{4}$	$y = -\frac{3}{4}x + \frac{5}{2}$	3	M1 for method to find gradient of L_1 or sight of “ $m = -\frac{3}{4}$ ” M1 for method to find equation, ie use of $y - y_1 = m(x - x_1)$ or $y = mx + c$, with attempt to find c A1 for $y = -\frac{3}{4}x + \frac{5}{2}$
	(b)	Gradient of L_1 is $-\frac{3}{4}$ Gradient of $L_3 = \frac{4}{3}$ $y - -5 = \frac{4}{3}(x - 0)$	$4x - 3y - 15 = 0$	3	M1 for method to find gradient of L_3 , eg use of $-\frac{1}{m}$ or sight of “ $m = \frac{4}{3}$ ” M1 for method to find equation, ie use of $y - y_1 = m(x - x_1)$ or $y = mx + c$, with attempt to find c A1 for $4x - 3y - 15 = 0$ or $-4x + 3y + 15 = 0$ (accept $4x + -3y + -15 = 0$)

PAPER: AAL30_01

Question		Working	Answer	Mark	Notes
4	(a)		2	1	B1 cao
	(b)		1.15 – 1.30	1	B1 for 1.15 -1.30
	(c)	2 × maximum height - 2	16.6	2	M1 for 9.2 – 9.4 or 7.2 – 7.4 or 18.4 – 18.8 A1 for 16.5 – 16.7
5	(a)	$5 - n > 6 \times 3$ $-n > 18 - 5$ $-n > 13$	$n < -13$	2	M1 for $5 - n > 6 \times 3$ or $\frac{-n}{3} > 6 - \frac{5}{3}$ or critical value of -13 A1 $n < -13$
	(b)		$x \leq 0, x \geq 4$	2	M1 for establishing critical values, 0, 4 A1 for $x \leq 0, x \geq 4$
6	(a)		$3x^2 - 11x + 10$	2	M1 for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs A1 for $3x^2 - 11x + 10$
	(b)	$\frac{2(3x - 5)}{(3x - 5)(2x - 4)}$	$\frac{1}{x - 2}$	2	M1 for a correct factorisation of denominator into linear factors, $(3x - 5)(2x - 4)$ or $2(3x - 5)(x - 2)$ or $(6x - 10)(x - 2)$ A1 for $\frac{1}{x - 2}$

Question		Working	Answer	Mark	Notes
7	(a)		Correct region shaded	5	M3 for drawing all 3 lines correctly (M2 for drawing 2 lines correctly) (M1 for drawing one line correctly) A2 for correct shading of correct triangle (A1 for correct shading for one inequality)
	(b)		(2, 2) (3, 2)	1	B1 ft from (a) provided a triangle is seen
8	(a)	$5^2 = (-4)^2 + 2 \times 10 \times s$	$\frac{9}{20}$	2	M1 for substitution into $v^2 = u^2 + 2as$ A1 for $\frac{9}{20}$ oe
	(b)	$f^2 = \frac{g}{g+1}$ $f^2(g+1) = g$ $f^2g + f^2 = g$ $f^2 = g - f^2g$ $f^2 = g(1 - f^2)$	$g = \frac{f^2}{1 - f^2}$	3	M1 for squaring both sides M1 for isolating terms in g on one side and terms without g on the other side A1 for $g = \frac{f^2}{1 - f^2}$ oe

PAPER: AAL30_01

Question	Working	Answer	Mark	Notes
9	(a)(i) (ii) (b) $(8x - 6)(4x + 1) = 0$ OR $a = 32, b = -16, c = -6$ $\frac{- -16 \pm \sqrt{(-16)^2 - 4 \times 32 \times -6}}{2 \times 32}$ $\frac{16 \pm \sqrt{256 + 768}}{64} =$ $\frac{16 \pm \sqrt{1024}}{64}$ $\frac{16 \pm 32}{64}$	$\frac{8}{16}$ $-\frac{3}{16}$ $-\frac{1}{4}, \frac{3}{4}$	2 2	B1 for $\frac{8}{16}$ oe B1 for $-\frac{3}{16}$ oe M1 for correct factorisation, eg $(4x - 3)(4x + 1)$ A1 oe OR M1 for correct use of formula eg $\frac{- -8 \pm \sqrt{(-8)^2 - 4 \times 16 \times -3}}{2 \times 16}$ A1 oe

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Question		Working						Answer	Mark	Notes											
10	(a)							correct sketch	2	M1 for correct shape in interval $0 \leq x \leq 360$ A1 fully correct sketch with 1 and -1 marked on y-axis											
	(b)							correct sketch	2	M1 for parabola with correct orientation or sketch of $y = \sqrt{x}$ or sketch of $y = -\sqrt{x}$ A1 fully correct sketch with vertex at $(0, 0)$											
	(c)	Circle, centre $(0, 0)$, radius 1						correct sketch	1	B1 for correct sketch											
11	(a)	$(x + 2)^2 - 4 + 7$						$(x + 2)^2 + 3$	2	M1 for $(x + 2)^2$ oe A1 for $(x + 2)^2 + 3$											
	(b)							$(-2, 3)$	1	B1 for $(-2, 3)$ or ft from (a)											
12	(a)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>19</td> <td>3</td> <td>-1</td> <td>1</td> <td>3</td> <td>-1</td> <td>-17</td> </tr> </table>	x	-3	-2	-1	0	1	2	3	y	19	3	-1	1	3	-1	-17	cubic graph	4	B1 for drawing suitable axes on grid M1 for calculating points for values of x from $x = -3$ to 3 with at least 4 correct A1 for all points correct A1 for drawing a smooth cubic curve through their correct points
	x	-3	-2	-1	0	1	2	3													
y	19	3	-1	1	3	-1	-17														
(b)	$-1.7, 0, 1.7$						solutions	2	M1 for correct use of cubic graph, eg line from 1 on y-axis across to graph or sight of $1 + 3x - x^3 = 1$ A1 ft from a cubic curve												

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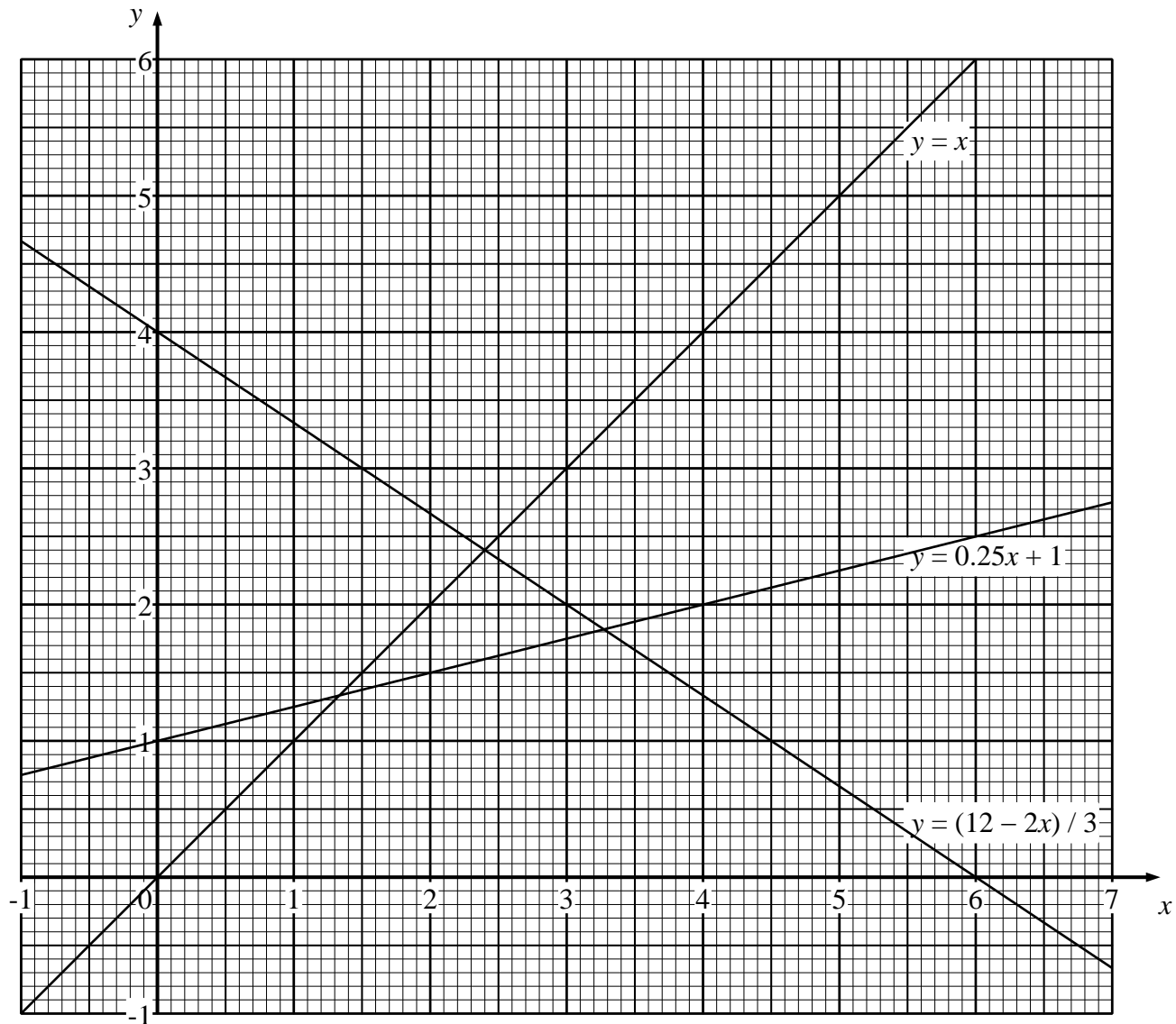
Question		Working	Answer	Mark	Notes
13			correct table	3	B3 for 5 correct answers (B2 for 3 or 4 correct answers) (B1 for 2 correct answers) If B0 scored, SCB1 for b^2-4ac
14	(a)		$2.5n + 0.5$	1	B1 for $2.5n + 0.5$ oe
	(b)	$a + (n - 1)d = 100.5$ $3 + (n - 1) \times 2.5 = 100.5$ $n = 40$ $\frac{1}{2} \times 40 \times (2 \times 3 + (40 - 1) \times 2.5)$ OR $\frac{1}{2} \times 40 \times (3 + 100.5)$	2070	3	B1 for $(n =) 40$ M1 for substituting into $S = \frac{1}{2}n(2a + (n - 1)d)$ A1 cao OR B1 for $(n =) 40$ M1 for substituting into $S = \frac{1}{2}n(a + l)$ A1 cao
15		$\frac{x+1-x}{x(x+1)} = 2$ $1 = 2x(x+1)$ $2x^2 + 2x - 1 = 0$ $x = \frac{-2 \pm \sqrt{12}}{4}$	$-\frac{1}{2} \pm \frac{1}{2} \sqrt{3}$	5	M1 for multiplying all terms by x or $(x + 1)$ or method to subtract $\frac{1}{x+1}$ from $\frac{1}{x}$ M1 for a method to clear the fractions M1 (dep M2) for correct method to solve the quadratic equation A1 for correct, unsimplified solutions A1 for $-\frac{1}{2} \pm \frac{1}{2} \sqrt{3}$

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Question		Working	Answer	Mark	Notes
16	(a)		53.6 – 54.4	3	M1 for reading off values 4, 5.6 - 5.7, 6.8 - 7.0, 8, 8.8 - 9.0 M1 for substituting values in trapezium rule, A1 for value in the range 53.6 to 54.4
	(b)		distance	1	B1 distance (travelled between $t = 2\text{s}$ and $t = 10\text{s}$)
17	(a)	$f = \frac{k}{d}$ $64 = \frac{k}{20}$ $k = 1280$	$f = \frac{1280}{d}$	3	M1 for $f \propto \frac{1}{d}$ or $f = \frac{k}{d}$ M1 for method to establish k ($= 1280$) A1 for $f = \frac{1280}{d}$
	(b)		sketch	1	B1 for correct general shape
18	(a)		correct sketch	2	M1 for reflection in x -axis oe A1 cao
	(b)		correct sketch	2	M1 for translation parallel to x -axis A1 cao
19			$\frac{3 + \sqrt{5}}{2}$	4	M1 for multiplying both numerator and denominator by a suitable expression, eg $(5 + \sqrt{5})$ M1(dep) for eg $(5 + \sqrt{5})(5 + \sqrt{5}) = 30 + 10\sqrt{5}$ or $(5 - \sqrt{5})(5 + \sqrt{5}) = 20$ A1 $\frac{30 + 10\sqrt{5}}{20}$ A1 cao

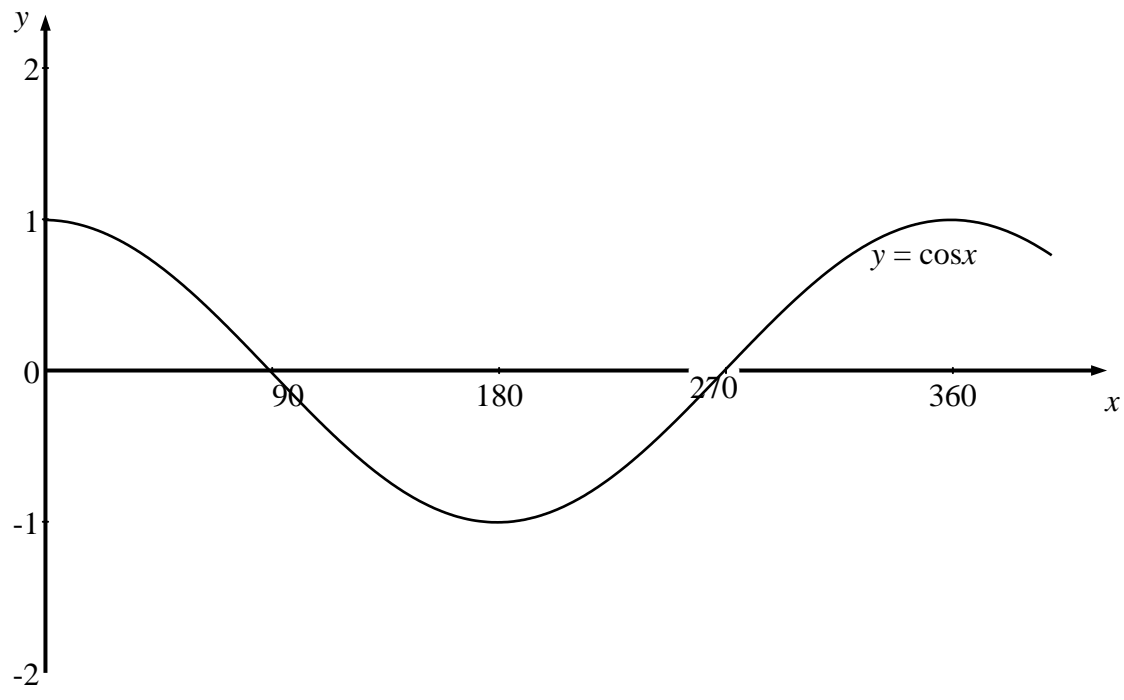
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Question	Working	Answer	Mark	Notes
20	$(x - 2)^2 + (x - 6)^2 = 8$ $x^2 - 8x + 16 = 0$ $(x - 4)^2 = 0$ $x = 4, y = 4 - 6$	$x = 4, y = -2$	4	M1 for eliminating one variable M1 for simplifying to get a quadratic = 0 in one variable M1 for factorising to obtain $(x - 4)^2 = 0$ or $(y + 2)^2 = 0$ A1 for $x = 4, y = -2$

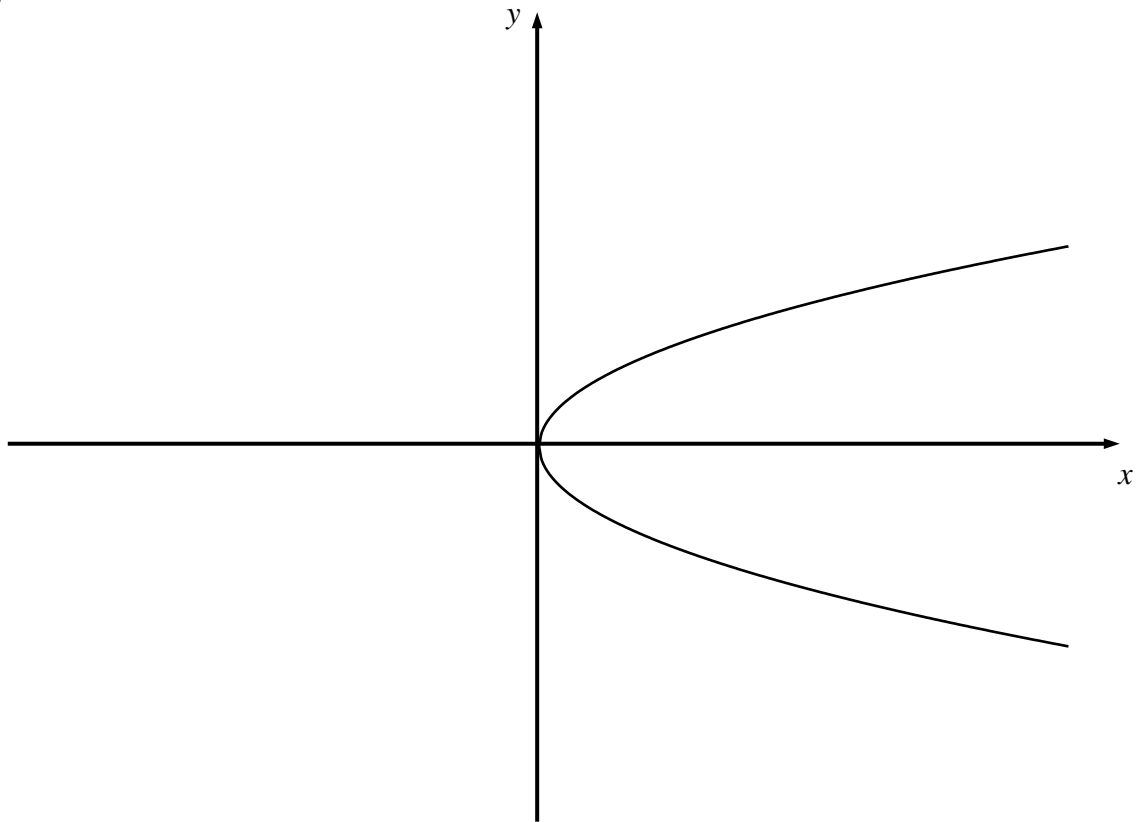
7(a)



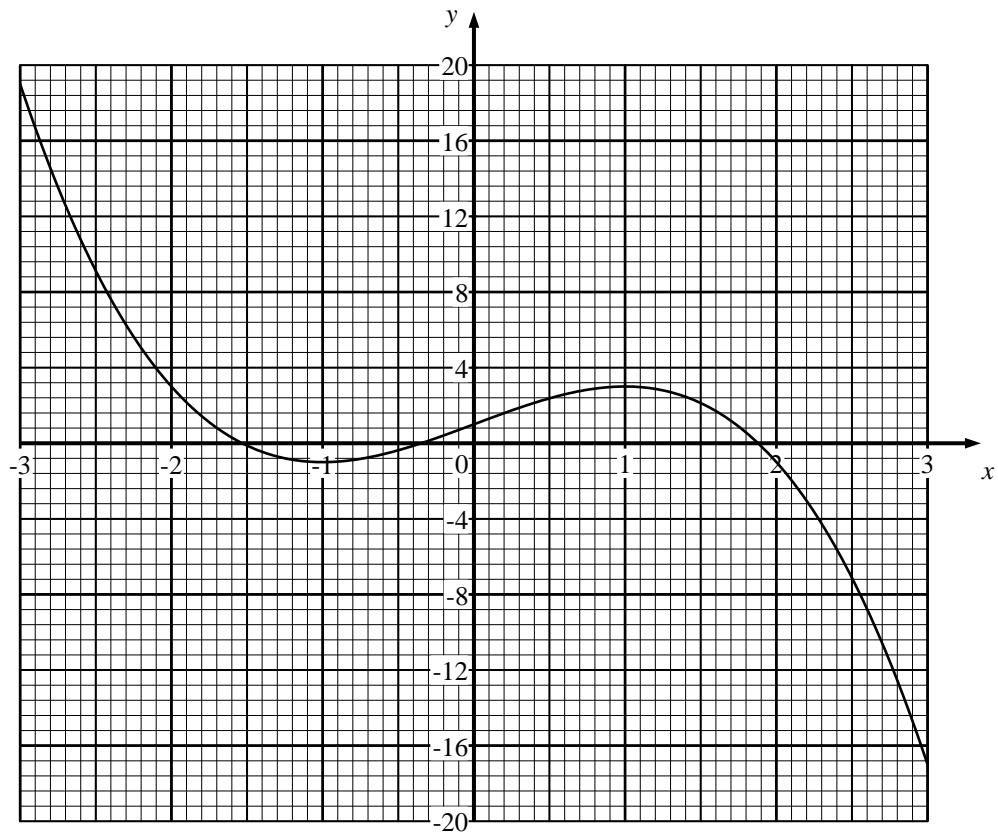
10(a)



10(b)

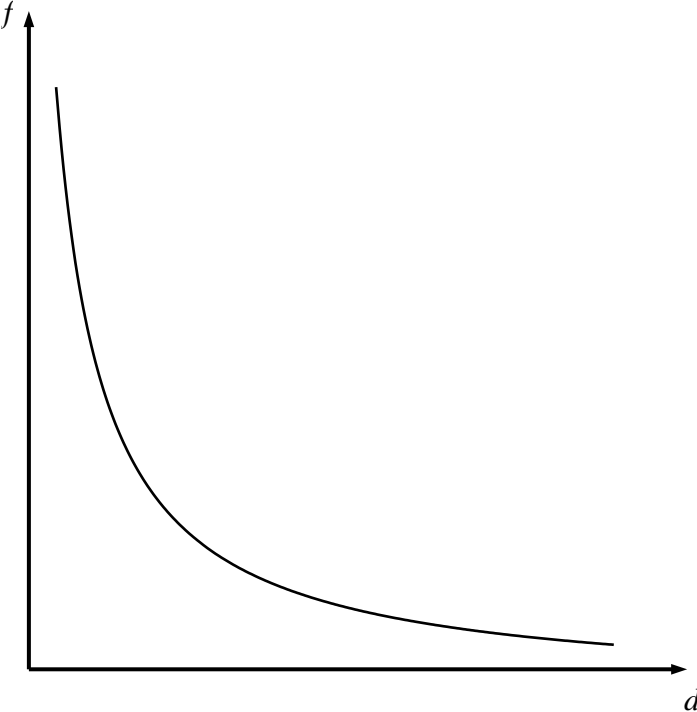


12(a)

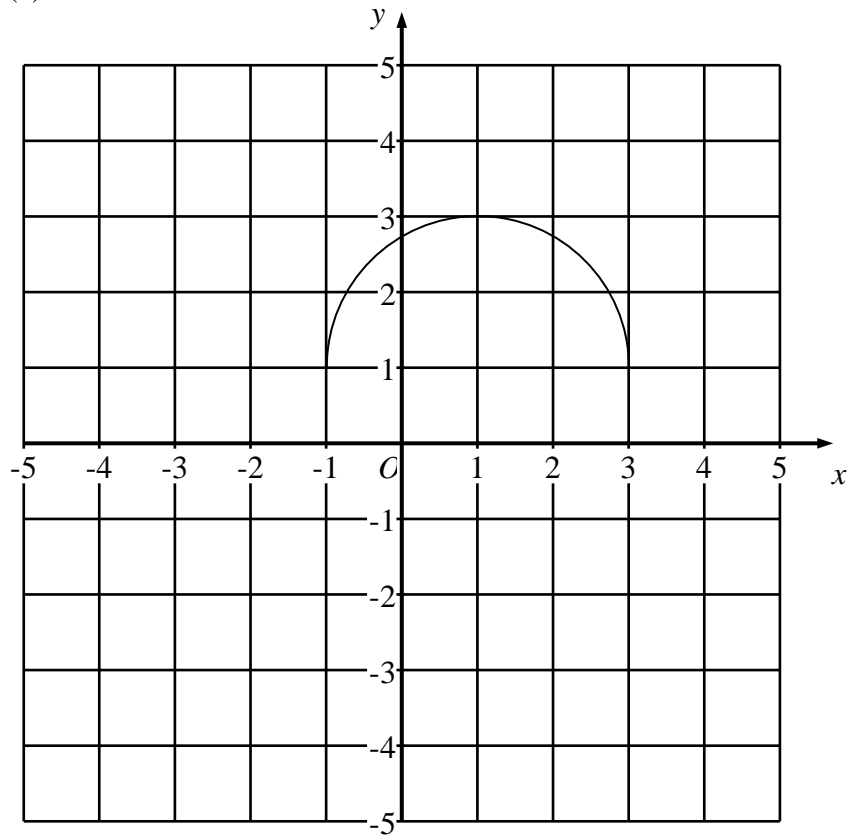


Equation	2 real and different roots	2 real and equal roots	No real roots
$x^2 + 4x + 1 = 0$	Y		
$2x^2 + 3x + 2 = 0$			Y
$x^2 - 22 = 0$	Y		
$9x^2 - 12x + 4 = 0$		Y	
$25x^2 - 10x - 1 = 0$	Y		

17(b)



18(a)



(b)

