

Write your name here

Surname

Other names

**Pearson
Edexcel Award**

Centre Number

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Candidate Number

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**Algebra
Level 3
Calculator NOT allowed**

Thursday 9 January 2014 – Morning
Time: 2 hours

Paper Reference

AAL30/01

You must have: Ruler graduated in centimetres and millimetres,
pair of compasses, pen, HB pencil, eraser.

Total Marks

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Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- **Calculators are not allowed.**



Information

- The total mark for this paper is 90
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

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Turn over ►

PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 (a) Simplify $\frac{x^6}{x}$

.....
(1)

(b) Simplify $y^{-2} \times y^{-3}$

.....
(1)

(c) Simplify $\left(\frac{1}{v^2}\right)^{-1}$

.....
(1)

(d) Simplify $\frac{w^{\frac{1}{2}} \times w^{\frac{3}{2}}}{w}$

.....
(2)

(Total for Question 1 is 5 marks)



2 (a) Find the gradient of a straight line which is parallel to the line $2x - 6y = 5$

.....
(2)

(b) Find an equation of a straight line which is perpendicular to the line $5x + y = 10$

.....
(2)

(Total for Question 2 is 4 marks)



3 (a) Expand and simplify $(2a - 3)(2a + 1)$

.....
(2)

(b) Factorise $9c^2d^2 - 24cd$

.....
(2)

(c) Factorise $100g^2 - 25h^2$

.....
(2)

(Total for Question 3 is 6 marks)



4 $p = \frac{2}{n^2} - 5$

Make n the subject of the formula.

.....
(Total for Question 4 is 3 marks)



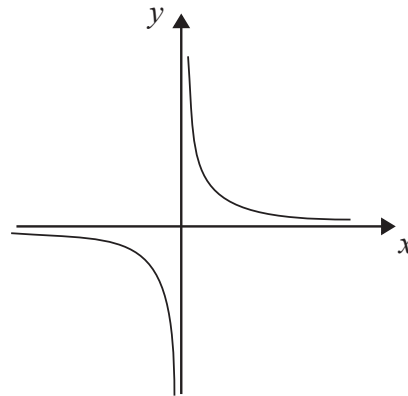
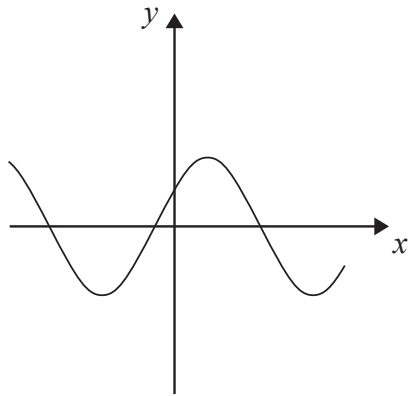
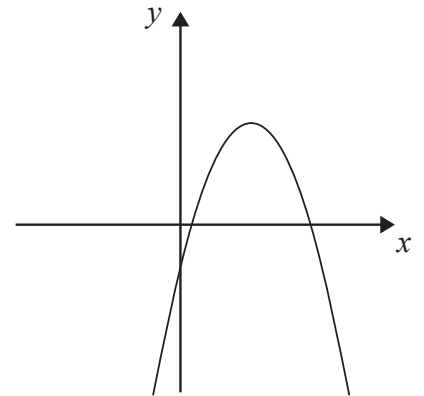
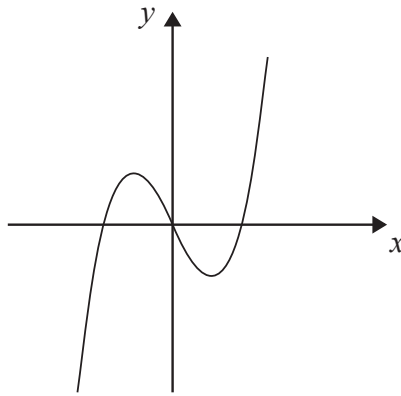
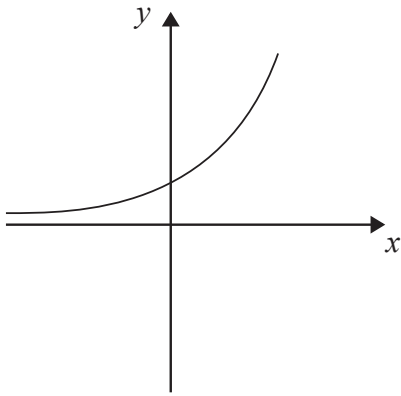
5 Use the quadratic formula to solve the equation $4x^2 - 6x + 1 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{r}$ where p , q and r are integers.

.....
(Total for Question 5 is 3 marks)



6 Here are some graphs of functions.



Here is a list of words that can be used to describe these graphs.

circular cubic exponential quadratic reciprocal

On the dotted line under each graph write the word from the list that can be used to describe the graph.

(Total for Question 6 is 3 marks)



7 Simplify $\frac{3}{2x} - \frac{9x}{6x^2 - 4x}$

(Total for Question 7 is 3 marks)



8 On the grid, shade the region that satisfies all these inequalities.

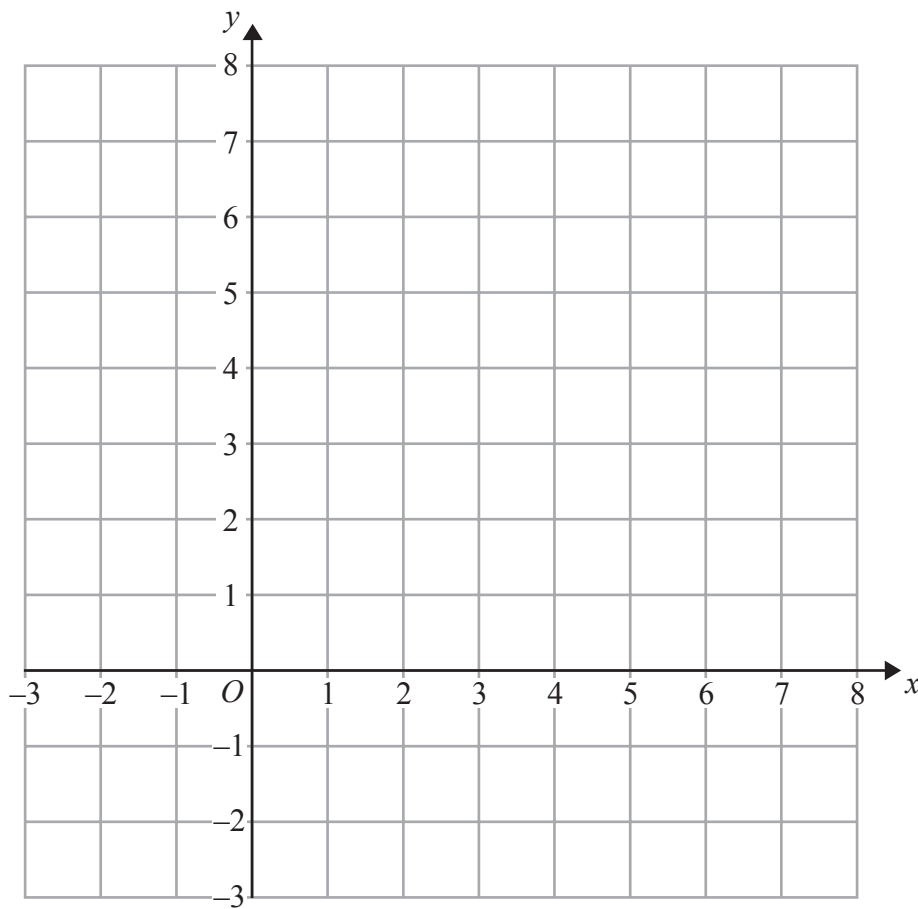
$x > 0$

$y > 0$

$x < 3$

$y < \frac{1}{2}x + 5$

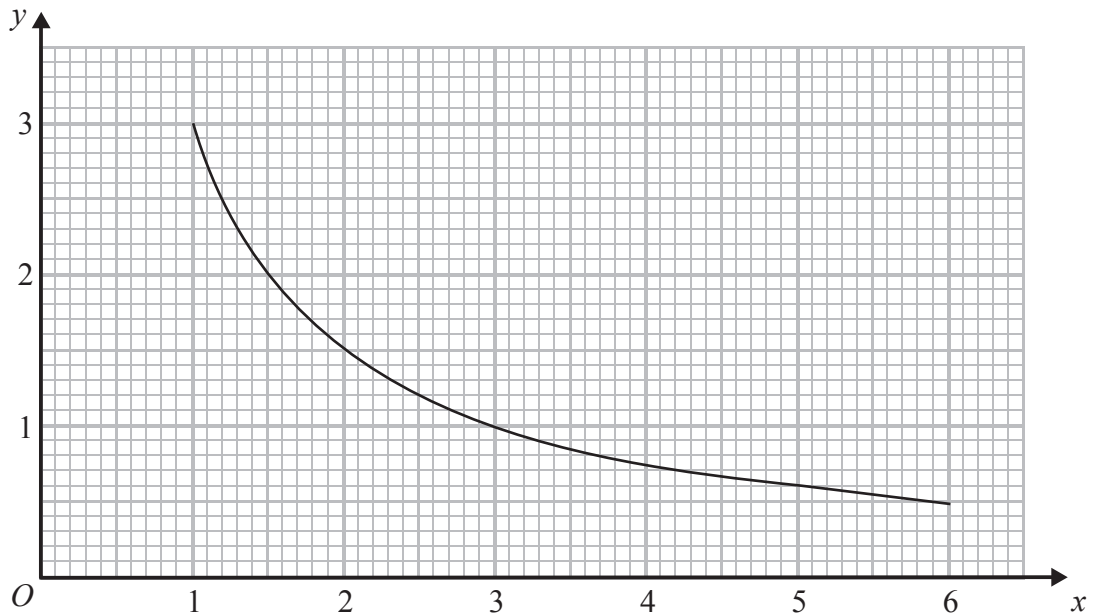
$3x + 2y > 6$



(Total for Question 8 is 5 marks)



9 Here is the graph of $y = \frac{3}{x}$ for values of x from 1 to 6



Use the trapezium rule to find the area of the region under the curve $y = \frac{3}{x}$ and between $x = 1$, $y = 0$ and $x = 6$

Use 5 strips of equal width.

.....
(Total for Question 9 is 3 marks)



10 (a) Solve $x^2 - x - 2 = 0$

.....
(2)

(b) Solve $3p^2 + p - 10 > 0$

.....
(3)

(Total for Question 10 is 5 marks)



11 The equation $ax^2 + 3x + 4 = 0$ has real roots.

(a) Find the range of possible values of a .

.....
(2)

The sum of the roots of the equation $6x^2 + bx + c = 0$ is $\frac{11}{6}$

The product of the roots of this equation is $-\frac{5}{3}$

(b) Find the value of b and the value of c .

$b =$

$c =$

(3)

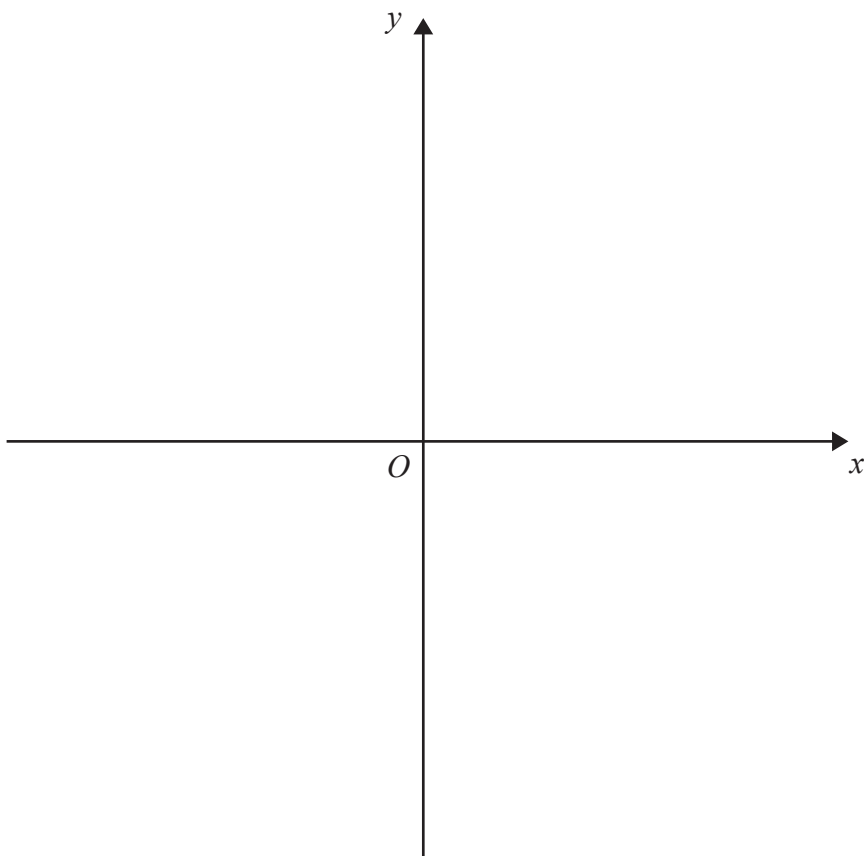
(Total for Question 11 is 5 marks)



12 (a) Write the quadratic expression $x^2 + 3x + 1$ in the form $(x + c)^2 + d$ where c and d are constants.

.....
(2)

(b) Sketch the graph of $y = x^2 + 3x + 1$ showing the coordinates of any points at which the graph intersects the y -axis.



(3)

(c) State the coordinates of the turning point on the graph of $y = x^2 + 3x + 1$

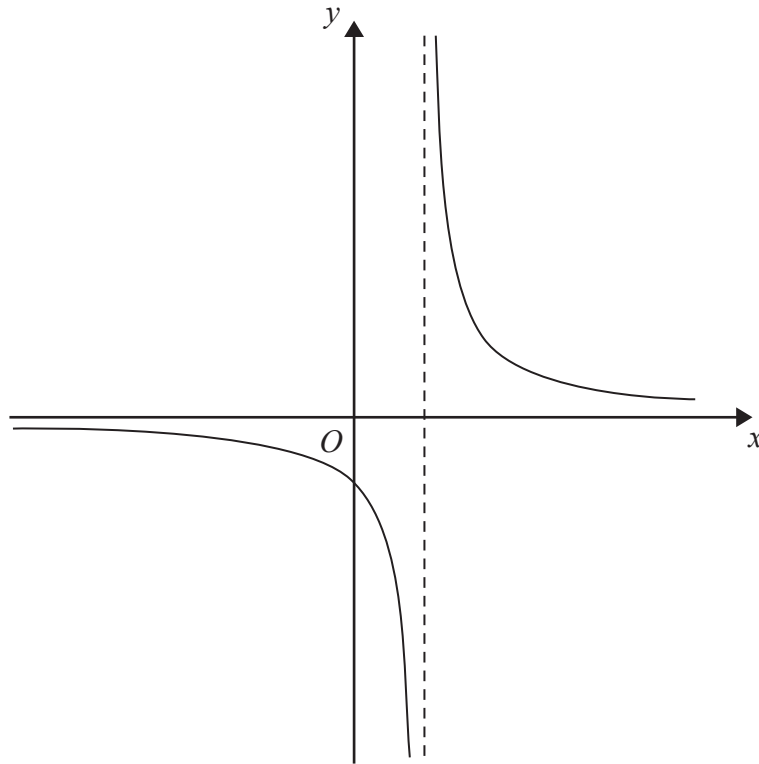
.....
(1)

(Total for Question 12 is 6 marks)



13 Here is a sketch graph of $y = f(x)$.

The graph passes through the point with coordinates $(0, -\frac{1}{2})$ and has two asymptotes $x = 2$ and $y = 0$



In the space opposite, sketch the graph of $y = f(\frac{1}{2}x)$.

State the equations of the asymptotes of this curve and show the coordinates of any points where the graph of $y = f(\frac{1}{2}x)$ intersects the axes.



(Total for Question 13 is 4 marks)

14 Solve the simultaneous equations

$$8x^2 + y^2 = 3$$

$$y = 2x$$

(Total for Question 14 is 4 marks)



15 (a) Write $\sqrt{108}$ in the form $n\sqrt{3}$ where n is an integer.

.....
(1)

(b) Simplify $(2 - \sqrt{3})(2 + \sqrt{3})$

.....
(2)

(c) Rationalise the denominator of $\frac{1}{2\sqrt{3}}$

Give your answer in the form $\frac{\sqrt{a}}{b}$ where a and b are integers.

.....
(2)

(Total for Question 15 is 5 marks)



16 The n th term of an arithmetic series is $5n - 3$

(a) (i) Find the first term of this series.

(ii) Find the common difference of this series.

(2)

(b) Find an expression, in terms of n , for the sum of the first n terms of this series.

(2)

(Total for Question 16 is 4 marks)



17 V is directly proportional to the cube of x .

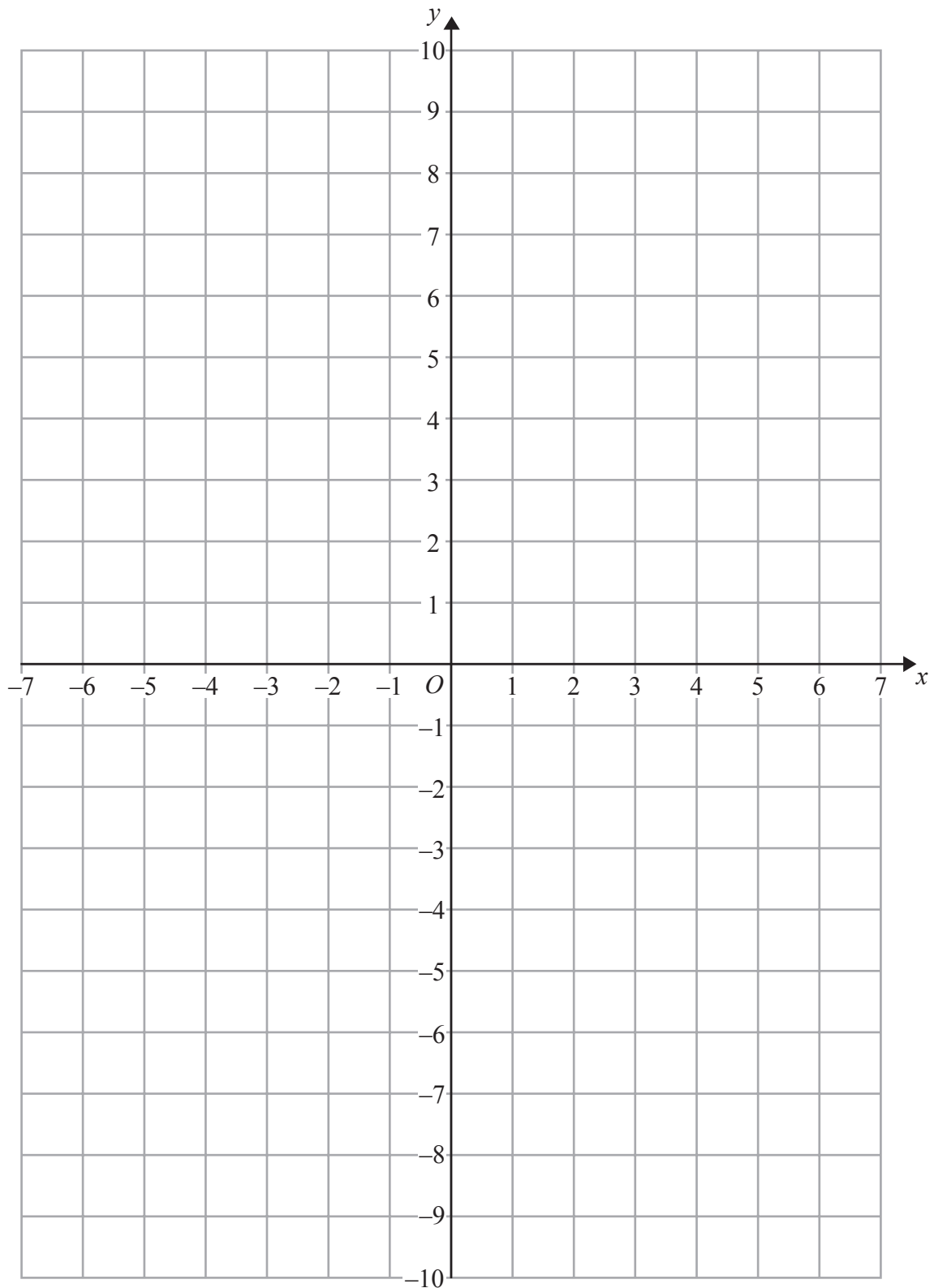
When $x = 3$, $V = 54$

Find a formula for V in terms of x .

.....
(Total for Question 17 is 3 marks)



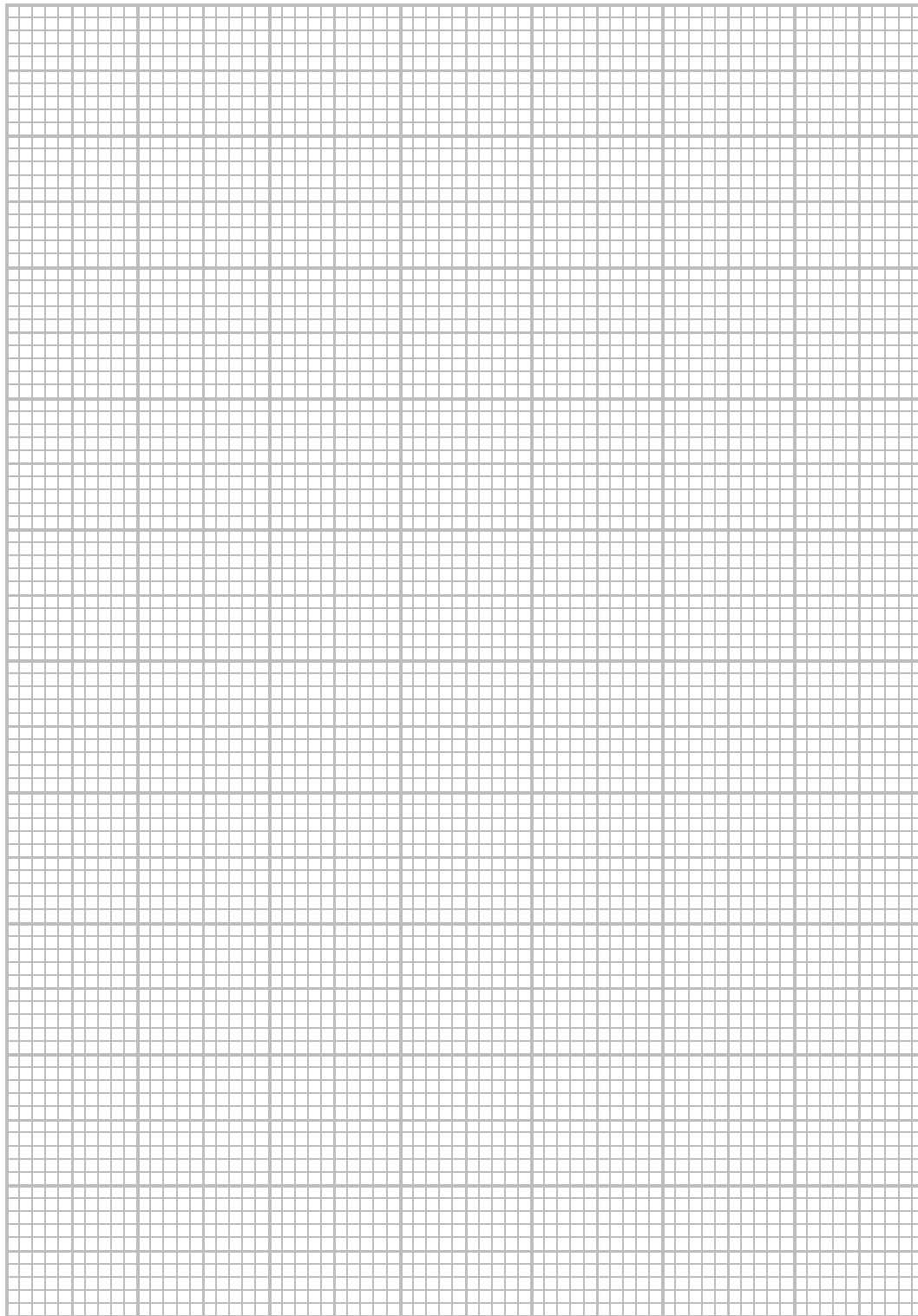
18 On the grid, construct the graph of $x^2 + y^2 - 36 = 0$



(Total for Question 18 is 2 marks)



19 (a) On the grid below, draw the graph of $y = x(6 - x^2)$ for values of x from -3 to $+3$



(4)



(b) Use your graph to find estimates for the solutions of $x(6 - x^2) = 1$

.....
(1)

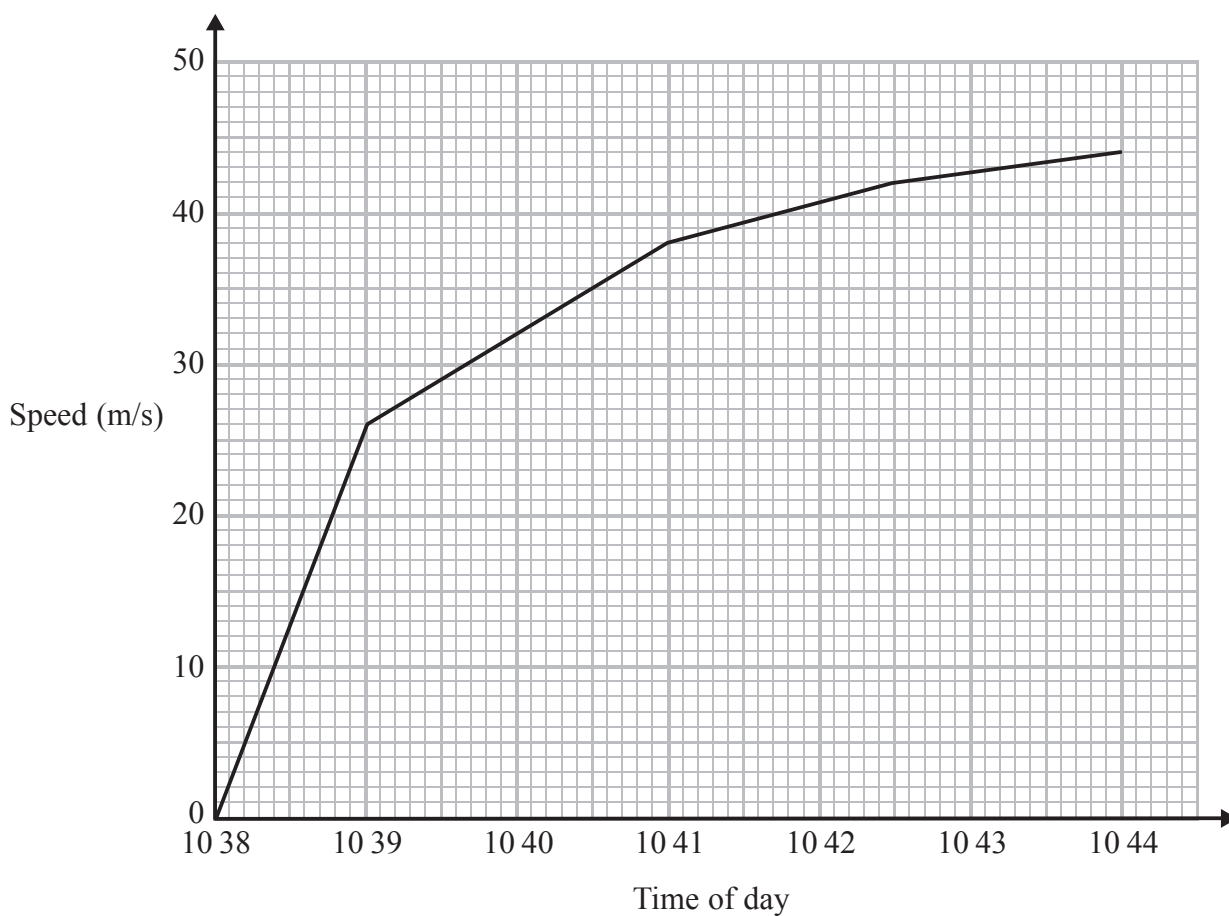
(c) Use your graph to find estimates for the solutions of $x^3 - 4x + 2 = 0$

.....
(2)

(Total for Question 19 is 7 marks)



20 Here is a speed-time graph for the first 6 minutes of a train's journey.



(a) Between which two times does the train have its greatest acceleration?

.....
(1)

(b) Calculate the acceleration of the train between 10:39 and 10:41

Give your answer in m/s^2 .

..... m/s^2
(2)



(c) Find the total distance, in metres, travelled by the train in the first 3 minutes of its journey.

..... m

(3)

(Total for Question 20 is 6 marks)



P 4 4 2 3 3 A 0 2 3 2 4

21 Solve

$$\frac{9}{10-x} + \frac{9}{10+x} = 5$$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS

