Write your name here

Surname	Other names

Pearson Edexcel Award

Centre Number	Candidate Number

Algebra

Level 3
Calculator NOT allowed

Thursday 11 January 2018 – 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

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.

Turn over ▶

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6/6/6/6/e2

P 5 6 4 7 4 A 0 1 2 4

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

You must NOT use a calculator.

1 (a) Factorise $20cd^2 - 15c^2d$

.....

(2)

(b) Factorise $5k^2 + 19k - 4$

.....

(2)

(Total for Question 1 is 4 marks)

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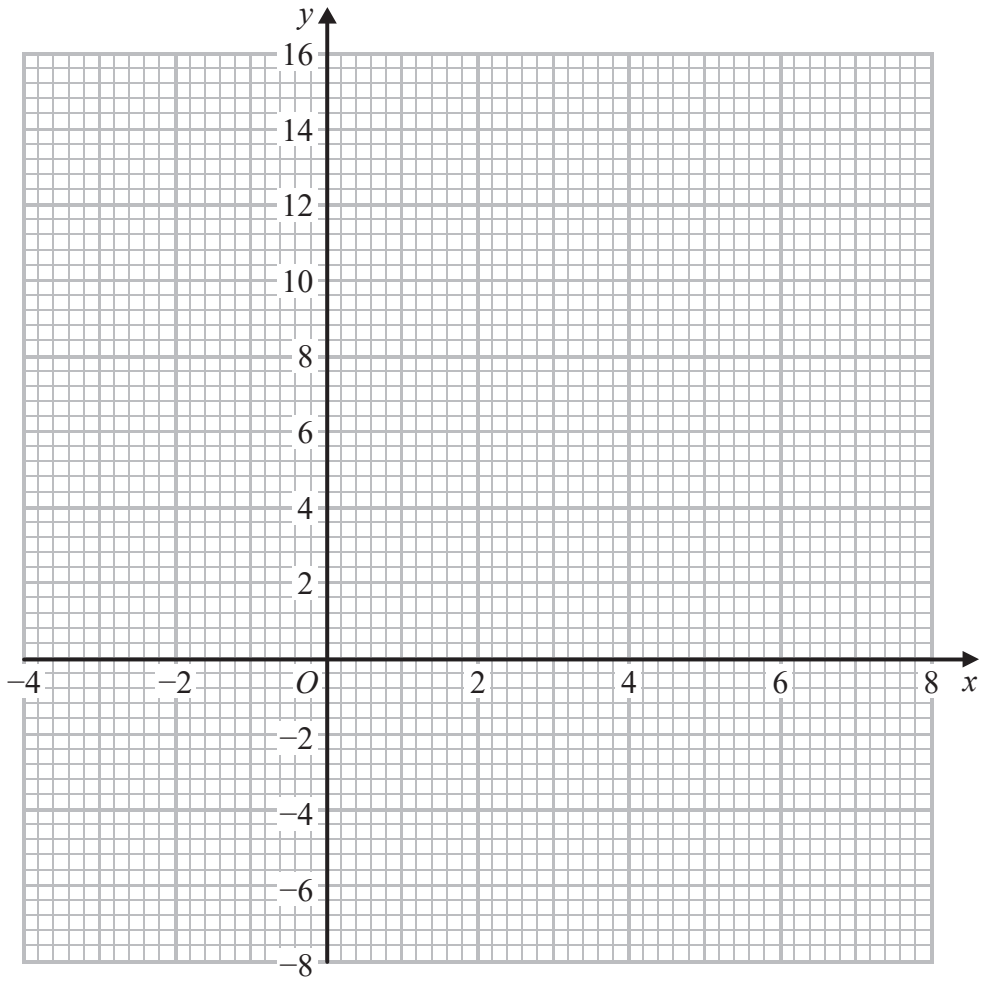
2 On the grid, shade the region that satisfies all these inequalities.

$$x > 0 \qquad y > 0 \qquad y > 3x - 6 \qquad 2x + y < 12$$

Label the region **R**.



(Total for Question 2 is 4 marks)

3 Solve $6(2 - 3x) < 5(x + 1)$

.....

(Total for Question 3 is 3 marks)

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

Give your answer in the form $\frac{p \pm \sqrt{q}}{5}$ where p and q are integers.

.....

(Total for Question 4 is 3 marks)

5 (i) Factorise $x^2 - 49$

.....

(ii) Simplify fully $\dfrac{x-1}{x+7} \div \dfrac{x^2-x}{x^2-49}$

.....

(Total for Question 5 is 4 marks)

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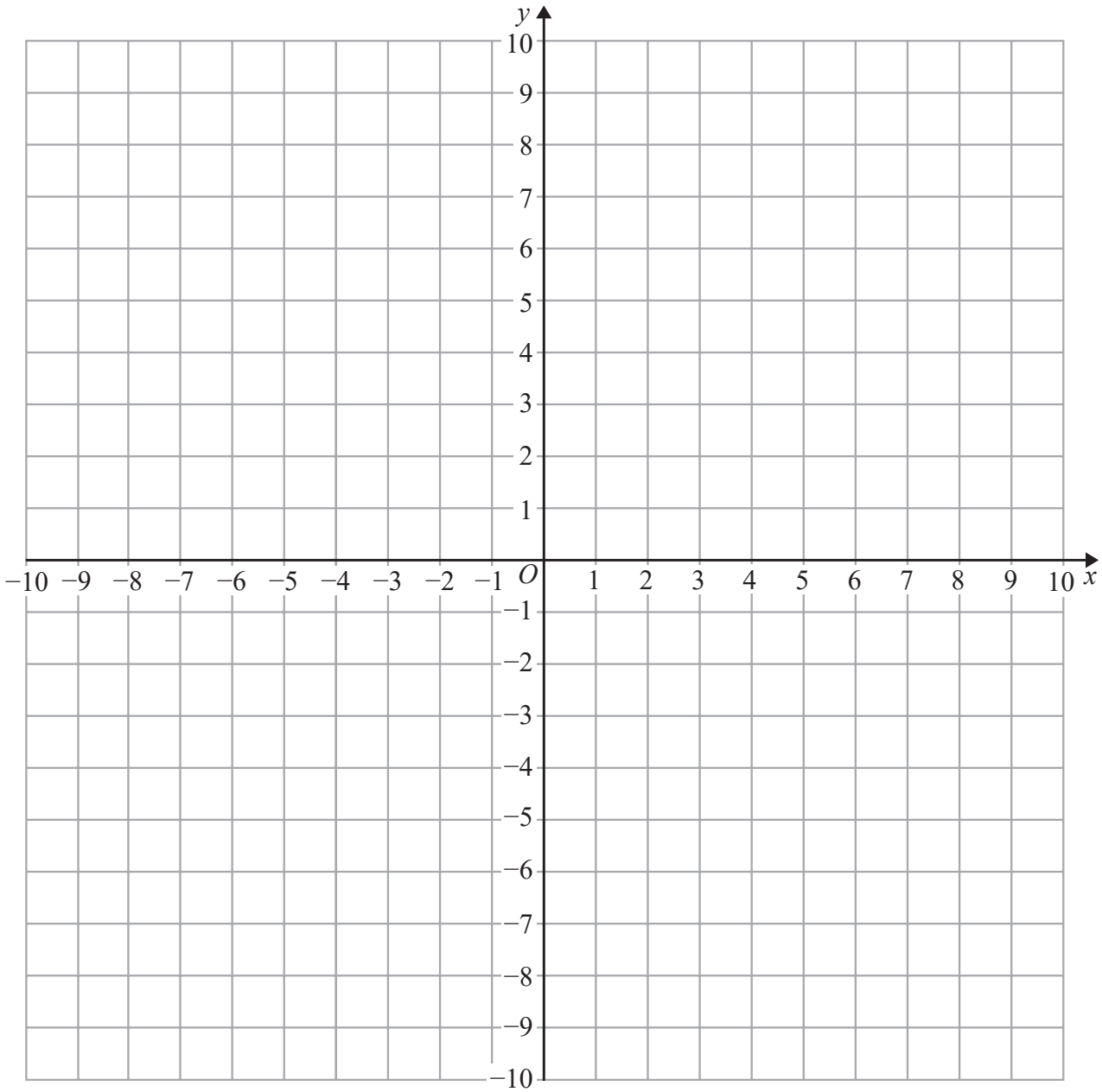
6 (a) On the grid, construct the graph of $x^2 + y^2 - 64 = 0$



(2)

(b) Make y the subject of $x^2 + y^2 - 64 = 0$

.....

(2)

(Total for Question 6 is 4 marks)

7 Express $\left(\sqrt{125} - \sqrt{5}\right)\left(\sqrt{8} - \sqrt{2}\right)$ in the form $a\sqrt{b}$ where a and b are integers.

.....

(Total for Question 7 is 3 marks)

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8 (a) Simplify $\left(\frac{x^5}{x^7}\right)^{-1}$

.....

(1)

(b) Simplify $\left(4y^{\frac{2}{3}}\right)^3$

.....

(2)

$6x^{-2}\left(\frac{1}{2}x^6 - \frac{1}{3}x^2\right)$ can be written in the form $ax^n + b$

(c) Find the value of a, the value of b and the value of n.

$a =$ .....

$b =$ .....

$n =$ .....

(2)

(d) Expand and simplify $(3y + 2)^2 - (3y - 2)^2$

.....

(2)

(Total for Question 8 is 7 marks)

9 The straight line $\mathbf{L}_1$ passes through the points P and Q with coordinates (2, 5) and (6, −2) respectively.

(a) Find an equation for $\mathbf{L}_1$ in the form $ax + by = c$ where a, b and c are integers.

.....

(3)

The straight line $\mathbf{L}_2$ is perpendicular to $\mathbf{L}_1$ and passes through the point (7, 5).

(b) Find an equation for $\mathbf{L}_2$ in the form $y = mx + c$

.....

(3)

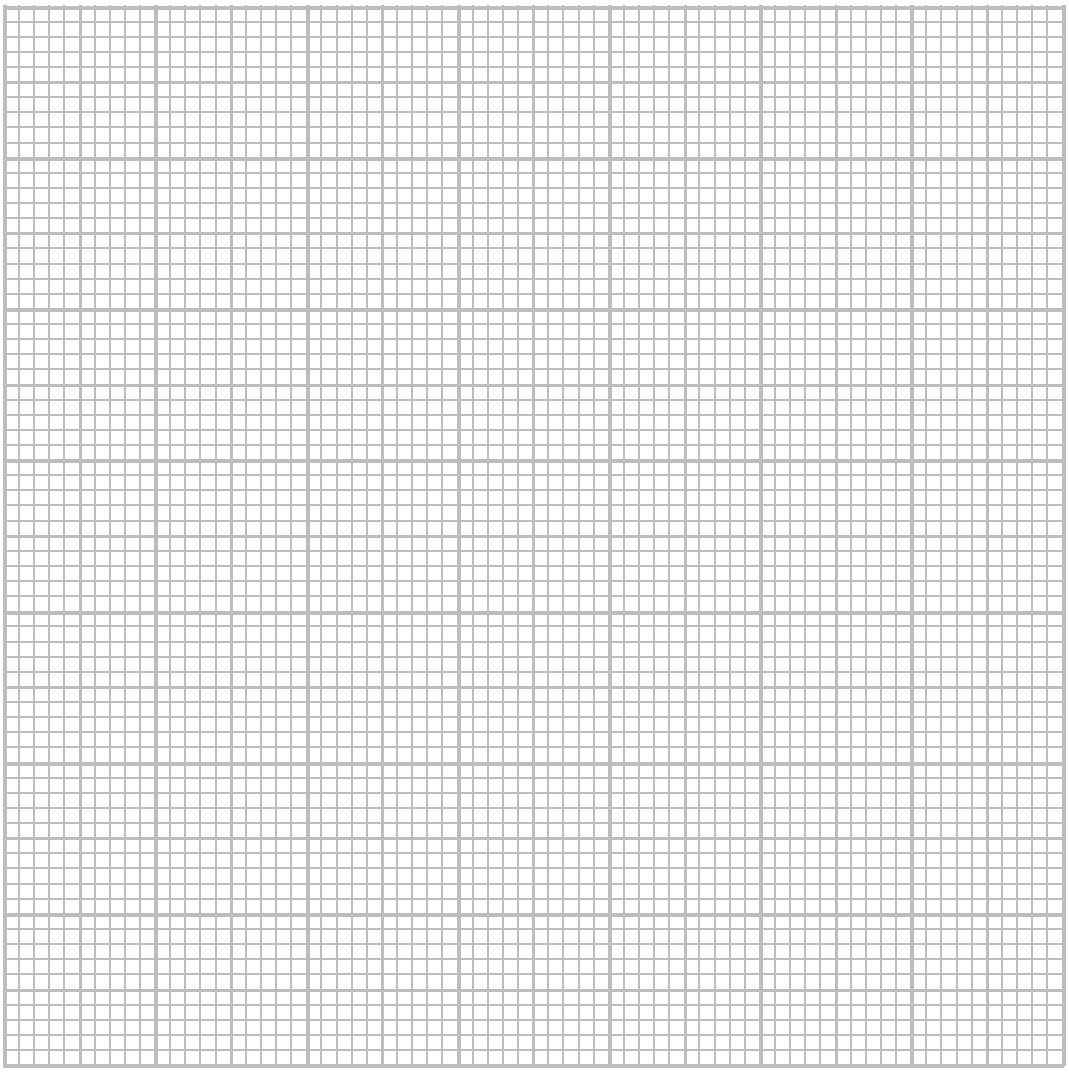
The straight lines $\mathbf{L}_3$ and $\mathbf{L}_4$ have equations $y = 3x$ and $x = 3y$ respectively.

(c) Are the lines $\mathbf{L}_3$ and $\mathbf{L}_4$ perpendicular to each other?
Give a reason for your answer.

(1)

(Total for Question 9 is 7 marks)

10 (a) On the grid below, draw the graph of $y = x^3 + x^2 - x - 5$ for values of x from -3 to 3



(4)

(b) Use your graph to find an estimate for the solution of $x^3 + x^2 - x - 1 = 4$

.....

(2)

(Total for Question 10 is 6 marks)

11 m is proportional to the square of h.

When $h = 0.5$, $m = 10$

(a) Find a formula for m in terms of h.

.....

(3)

(b) Calculate the values of h when $m = 160$

.....

(2)

(Total for Question 11 is 5 marks)

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12 (a) Complete the table of values for $y = 3^x$

x	-1	0	1	2	3
y					

(2)

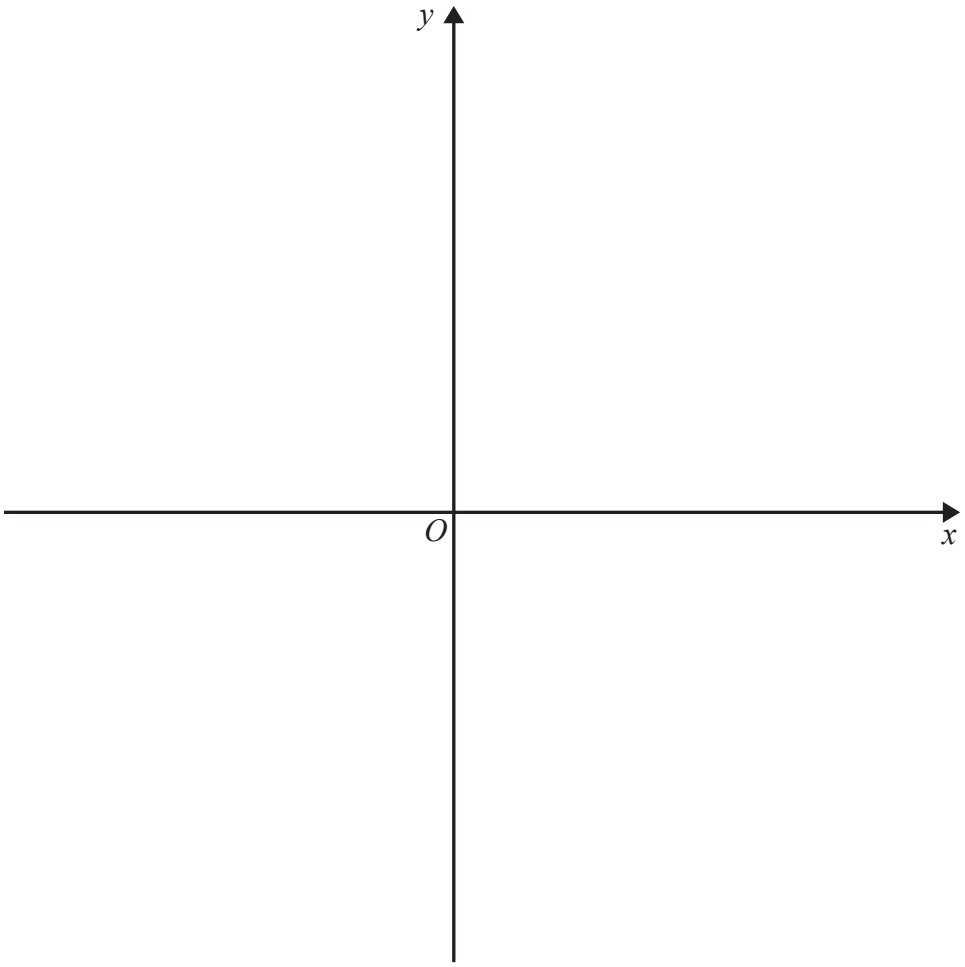
(b) Use the trapezium rule to find an estimate for the area of the region under the curve $y = 3^x$, between $x = -1$ and $x = 3$ and above $y = 0$
Use 4 strips of equal width.

.....

(3)

(Total for Question 12 is 5 marks)

13 Sketch the graph of $x = y^2 - 1$



(Total for Question 13 is 3 marks)

14 The first term of an arithmetic series is 200
The common difference of the same series is −2.5

(a) Work out the 51st term of this series.

.....

(2)

The common difference of a different arithmetic series is 10
The sum of the first 80 terms of this arithmetic series is 40 000

(b) Work out the first term of this series.

.....

(3)

(Total for Question 14 is 5 marks)

15 (a) Solve the equation $6x^2 - 22x - 8 = 0$

.....

(2)

$3x^2 - 15x + 8 = 3(x + p)^2 + q$ for all values of x.

(b) Find the value of p and the value of q.

$p =$ .....

$q =$ .....

(3)

(c) Write down the product of the roots of the equation $3x^2 - 15x + 8 = 0$

.....

(1)

(Total for Question 15 is 6 marks)

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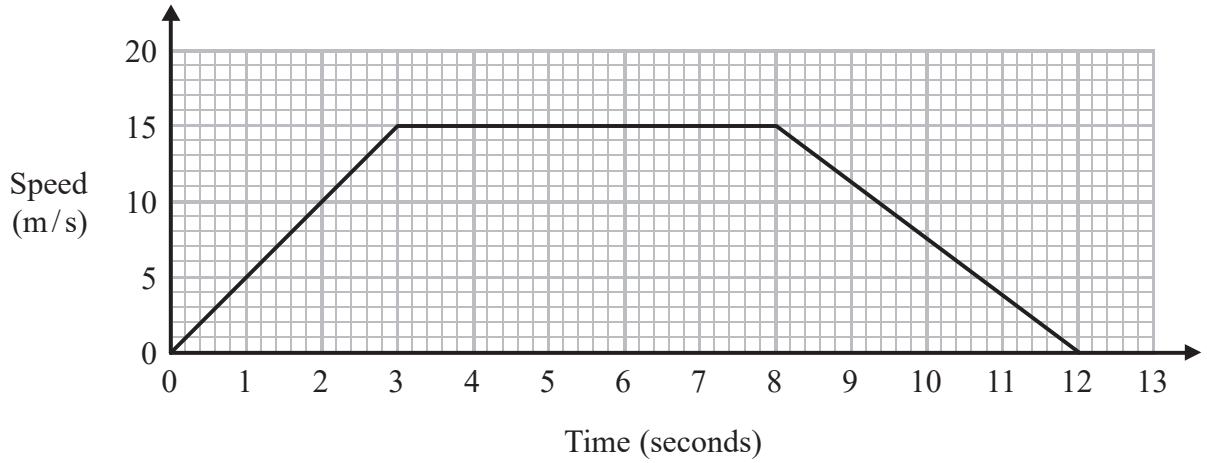
16 Here is the speed-time graph of a car travelling between two road junctions.



(a) Work out the distance between the two road junctions.

..... m

(3)

(b) Work out the deceleration in the last 4 seconds of its journey between the two road junctions.

..... m/s^2

(2)

(Total for Question 16 is 5 marks)

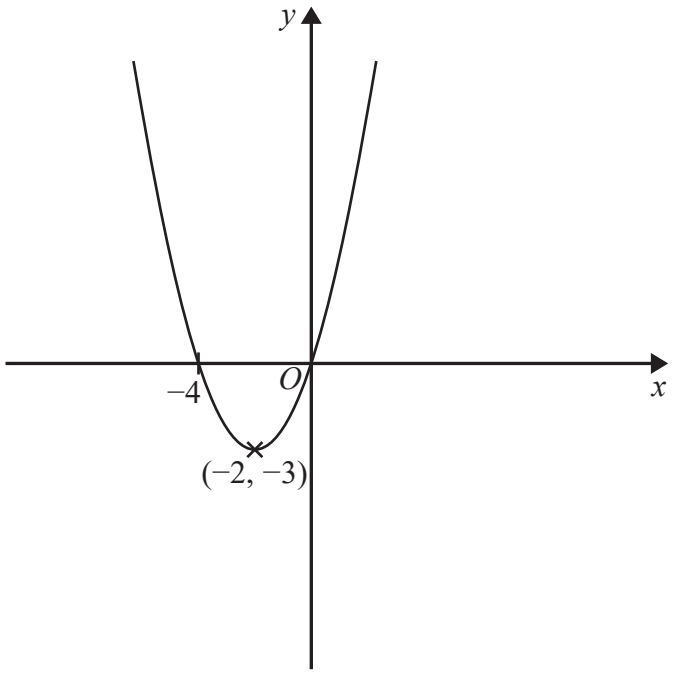
17 Solve, algebraically, the simultaneous equations

$$32x^2 - 9y^2 = 1$$
$$3y = 4x$$

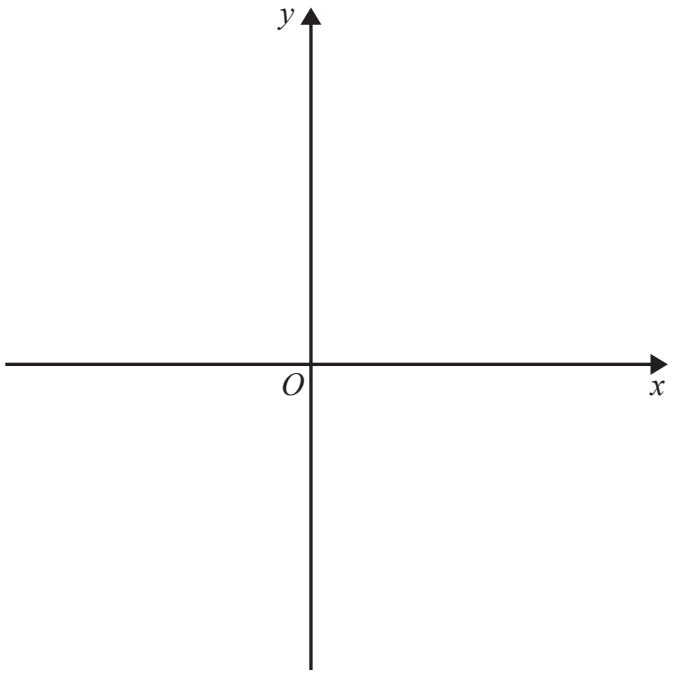
.....

(Total for Question 17 is 4 marks)

18 Here is the graph of $y = f(x)$



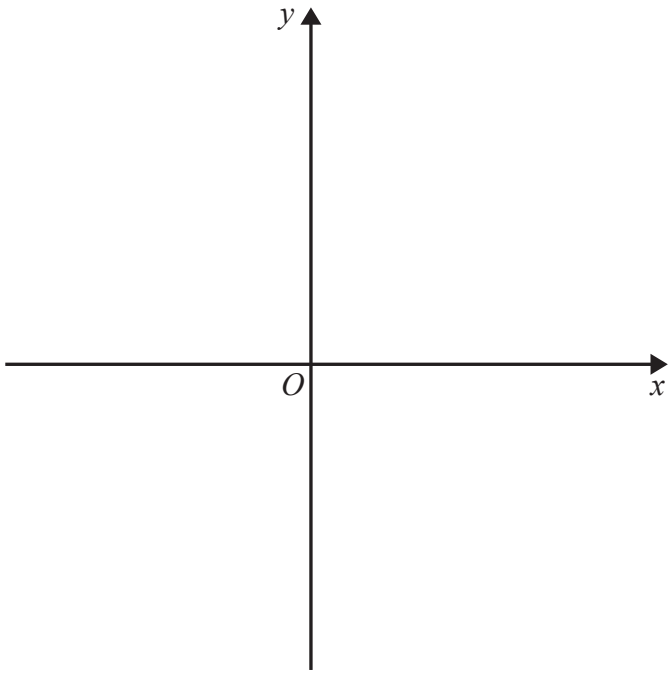
(a) On the axes below, sketch the graph of $y = -f(x)$
On your sketch, show the coordinates of any points where the graph intersects the x-axis and show the coordinates of any turning points.



(2)

(b) On the axes below, sketch the graph of $y = \frac{1}{2}\,f(x)$

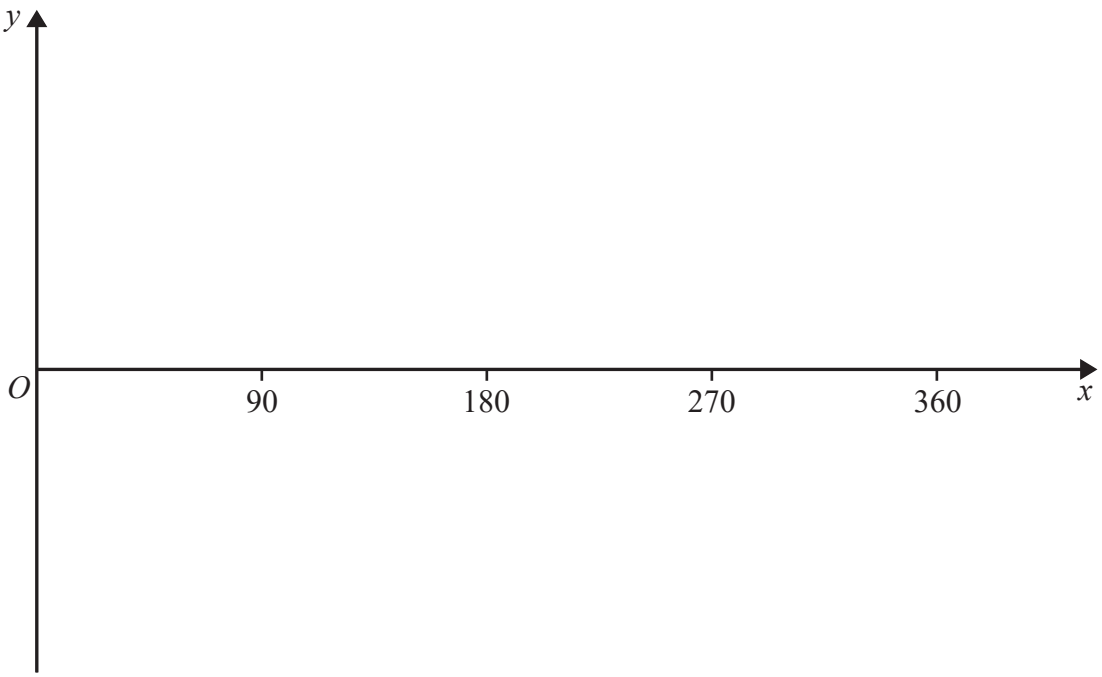
On your sketch, show the coordinates of any points where the graph intersects the x-axis and show the coordinates of any turning points.



(2)

(Total for Question 18 is 4 marks)

19 Sketch the graph of $y = \cos x°$ for $0 \leqslant x \leqslant 360$



(Total for Question 19 is 2 marks)

20 The equation $px^2 + (p - 6)x + 2 = 0$ has two real and different roots.

(a) Show that $p^2 - 20p + 36 > 0$

(3)

(b) Solve $p^2 - 20p + 36 > 0$

.....

(3)

(Total for Question 20 is 6 marks)

TOTAL FOR PAPER IS 90 MARKS

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