

Write your name here	
Surname	Other names
Pearson Edexcel GCE	Centre Number Candidate Number
A level Mathematics Practice Paper Pure Mathematics - Algebra and functions	
You must have: Mathematical Formulae and Statistical Tables (Pink)	Total Marks

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all the questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
- There are 16 questions in this question paper. The total mark for this paper is 100.
- The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.
- Calculators must not be used for questions marked with a * sign.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

1. The functions f and g are defined by

$$f : x \rightarrow 7x - 1, \quad x \in \mathbb{R},$$

$$g : x \rightarrow \frac{4}{x-2}, \quad x \neq 2, x \in \mathbb{R},$$

(a) Solve the equation $fg(x) = x$.

(4)

(b) Hence, or otherwise, find the largest value of a such that $g(a) = f^{-1}(a)$.

(1)

(Total 5 marks)

2. Given that

$$f(x) = \ln x, \quad x > 0$$

sketch on separate axes the graphs of

(i) $y = f(x)$,

(ii) $y = |f(x)|$,

(iii) $y = -f(x - 4)$.

Show, on each diagram, the point where the graph meets or crosses the x -axis.
In each case, state the equation of the asymptote.

(Total 7 marks)

3.

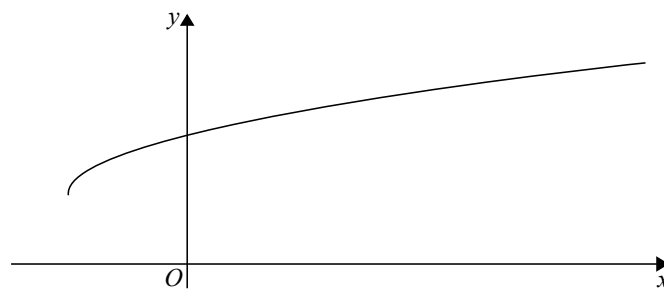


Figure 1

Figure 1 shows a sketch of part of the graph of $y = g(x)$, where

$$g(x) = 3 + \sqrt{x+2}, \quad x \geq -2$$

(a) State the range of g . (1)

(b) Find $g^{-1}(x)$ and state its domain. (3)

(c) Find the exact value of x for which $g(x) = x$ (4)

(d) Hence state the value of a for which $g(a) = g^{-1}(a)$ (1)

(Total 9 marks)

4.

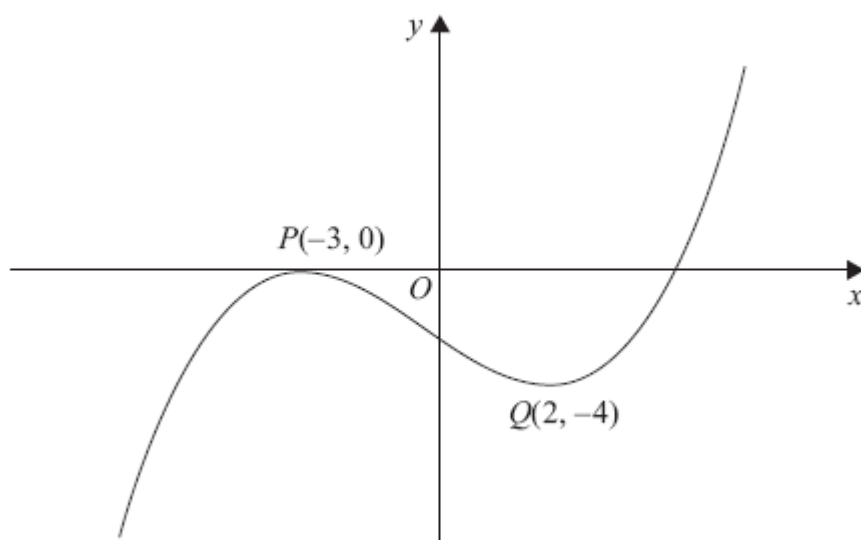


Figure 2

Figure 2 shows the graph of equation $y = f(x)$.

The points $P(-3, 0)$ and $Q(2, -4)$ are stationary points on the graph.

Sketch, on separate diagrams, the graphs of

(a) $y = 3f(x + 2)$, (3)

(b) $y = |f(x)|$. (3)

On each diagram, show the coordinates of any stationary points.

(Total 6 marks)

5.

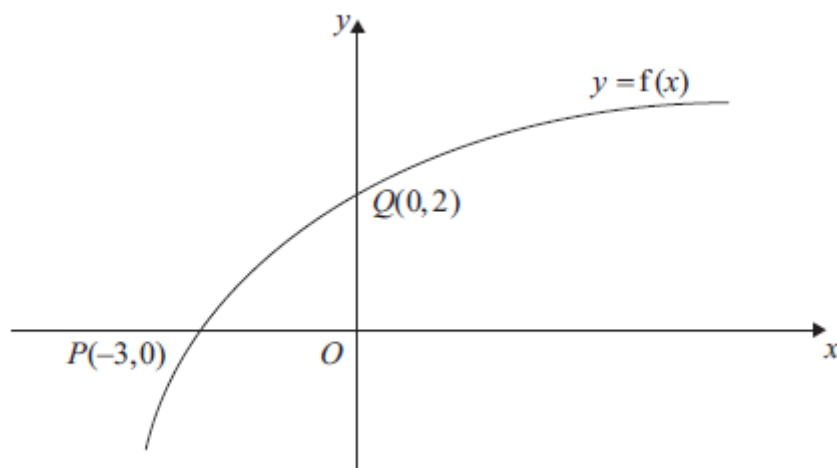


Figure 3

Figure 3 shows part of the curve with equation $y = f(x)$, $x \in \mathbb{R}$.

The curve passes through the points $Q(0, 2)$ and $P(-3, 0)$ as shown.

- (a) Find the value of $ff(-3)$. (2)

On separate diagrams, sketch the curve with equation

- (b) $y = f^{-1}(x)$, (2)

- (c) $y = f(|x|) - 2$, (2)

- (d) $y = 2f\left(\frac{1}{2}x\right)$. (3)

Indicate clearly on each sketch the coordinates of the points at which the curve crosses or meets the axes.

(Total 9 marks)

6.

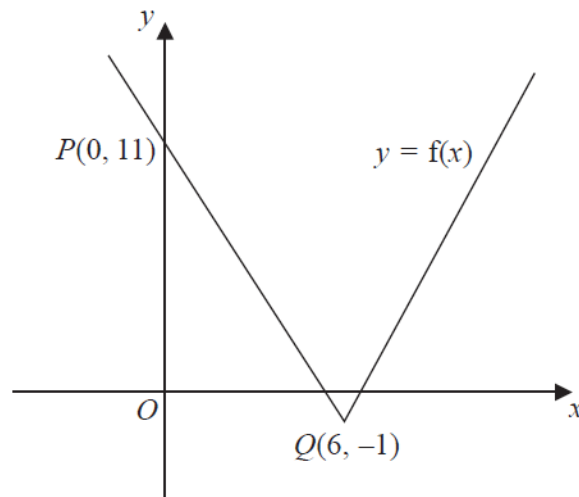


Figure 4

Figure 4 shows part of the graph with equation $y = f(x)$, $x \in \mathbb{R}$.

The graph consists of two line segments that meet at the point $Q(6, -1)$.

The graph crosses the y -axis at the point $P(0, 11)$.

Sketch, on separate diagrams, the graphs of

(a) $y = |f(x)|$ (2)

(b) $y = 2f(-x) + 3$ (3)

On each diagram, show the coordinates of the points corresponding to P and Q .

Given that $f(x) = a|x - b| - 1$, where a and b are constants,

(c) state the value of a and the value of b . (2)

(Total 7 marks)

7.

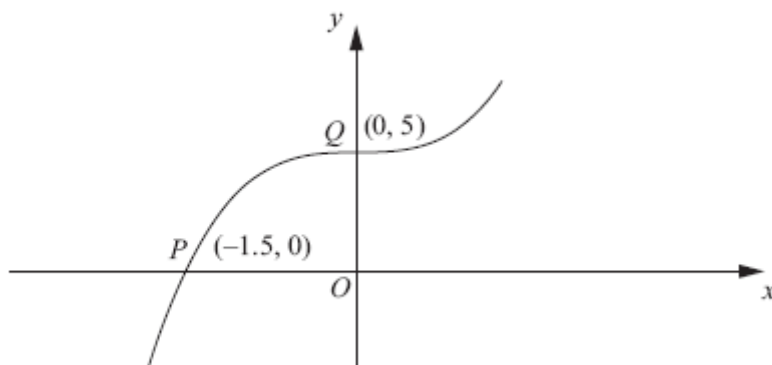


Figure 5

Figure 5 shows part of the curve with equation $y = f(x)$.
The curve passes through the points $P(-1.5, 0)$ and $Q(0, 5)$ as shown.

On separate diagrams, sketch the curve with equation

(a) $y = |f(x)|$ (2)

(b) $y = f(|x|)$ (2)

(c) $y = 2f(3x)$ (3)

Indicate clearly on each sketch the coordinates of the points at which the curve crosses or meets the axes.

(Total 7 marks)

8. (a) Sketch the graph with equation

$$y = |4x - 3|$$

stating the coordinates of any points where the graph cuts or meets the axes.

(2)

Find the complete set of values of x for which

(b)

$$|4x - 3| > 2 - 2x$$

(4)

(c)

$$|4x - 3| > \frac{3}{2} - 2x$$

(2)

(Total 8 marks)

9. $g(x) = \frac{x}{x+3} + \frac{3(2x+1)}{x^2+x-6}, \quad x > 3$

(a) Show that $g(x) = \frac{x+1}{x-2}, \quad x > 3$

(4)

(b) Find the range of g .

(2)

(c) Find the exact value of a for which $g(a) = g^{-1}(a)$.

(4)

(Total 10 marks)

10. Given that a and b are positive constants,

(a) on separate diagrams, sketch the graph with equation

(i) $y = |2x - a|$

(ii) $y = |2x - a| + b$

Show, on each sketch, the coordinates of each point at which the graph crosses or meets the axes.

(4)

Given that the equation

$$|2x - a| + b = \frac{3}{2}x + 8$$

has a solution at $x = 0$ and a solution at $x = c$,

(b) find c in terms of a .

(4)

(Total 8 marks)