



This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

4.

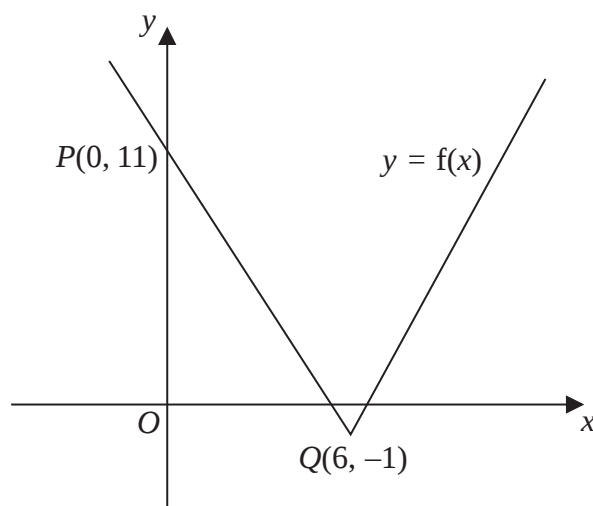


Figure 1

Figure 1 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)



Question 4 continued



P 4 3 1 6 4 A 0 9 3 2

5.

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

- (a) Show that $g(x) = \frac{x+1}{x-2}$, $x > 3$ (4)
- (b) Find the range of g . (2)
- (c) Find the exact value of a for which $g(a) = g^{-1}(a)$. (4)



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6.

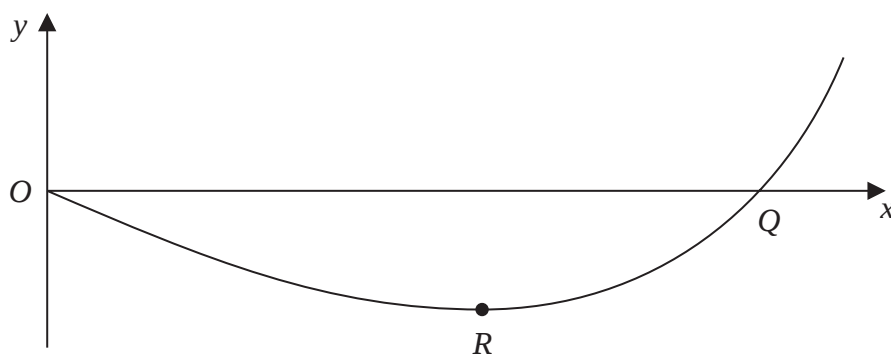


Figure 2

Figure 2 shows a sketch of part of the curve with equation

$$y = 2 \cos\left(\frac{1}{2}x^2\right) + x^3 - 3x - 2$$

The curve crosses the x -axis at the point Q and has a minimum turning point at R .

(a) Show that the x coordinate of Q lies between 2.1 and 2.2 (2)

(b) Show that the x coordinate of R is a solution of the equation

$$x = \sqrt{1 + \frac{2}{3}x \sin\left(\frac{1}{2}x^2\right)}$$

(4)

Using the iterative formula

$$x_{n+1} = \sqrt{1 + \frac{2}{3}x_n \sin\left(\frac{1}{2}x_n^2\right)}, \quad x_0 = 1.3$$

(c) find the values of x_1 and x_2 to 3 decimal places. (2)



[illegible]

7. (a) Show that

$$\operatorname{cosec} 2x + \cot 2x = \cot x, \quad x \neq 90n^\circ, \quad n \in \mathbb{Z}$$

(5)

(b) Hence, or otherwise, solve, for $0 \leq \theta < 180^\circ$,

$$\operatorname{cosec}(4\theta + 10^\circ) + \cot(4\theta + 10^\circ) = \sqrt{3}$$

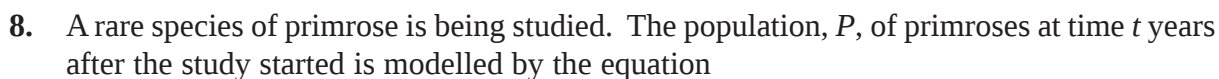
You must show your working.

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(5)



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[illegible]

