8.

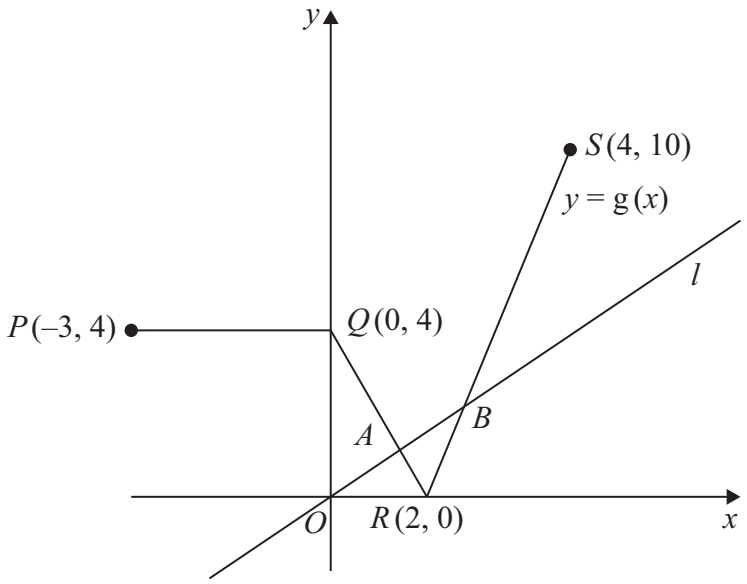


Figure 4

Figure 4 shows a sketch of the graph of $y = g(x)$, $-3 \leqslant x \leqslant 4$ and part of the line l with equation $y = \frac{1}{2}x$

The graph of $y = g(x)$ consists of three line segments, from $P(-3, 4)$ to $Q(0, 4)$, from $Q(0, 4)$ to $R(2, 0)$ and from $R(2, 0)$ to $S(4, 10)$.

The line l intersects $y = g(x)$ at the points A and B as shown in Figure 4.

(a) Use algebra to find the x coordinate of the point A and the x coordinate of the point B.
Show each step of your working and give your answers as exact fractions.

(6)

(b) Sketch the graph with equation

$$y = \frac{3}{2}g(x) \qquad -3 \leqslant x \leqslant 4$$

On your sketch show the coordinates of the points to which P, Q, R and S are transformed.

(2)

(Total for Question 8 is 8 marks)

9. The curve C has equation $y = f(x)$, $x > 0$ where

$$f'(x) = 30 + \frac{6 - 5x^2}{\sqrt{x}}$$

Given that the point $P(4, -8)$ lies on C,

(a) find the equation of the normal to C at P, giving your answer in the form $y = mx + c$, where m and c are constants.

(4)

(b) Find $f(x)$, giving each term in its simplest form.

(5)

(Total for Question 9 is 9 marks)

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10. (a) On the axes in the answer book sketch and clearly label the graphs of

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

(ii) $y = x^2(b - x)$

where a and b are positive constants $b > a$

Show clearly the coordinates of all the points where the curves cross or meet the coordinate axes.

(5)

(b) Show that the x-coordinates of the points of intersection of

$$y = x(4 - x) \quad \text{and} \quad y = x^2(7 - x)$$

are given by the solutions to the equation

$$x(x^2 - 8x + 4) = 0$$

(2)

The point A lies on both of the curves and the x and y coordinates of A are both positive.

(c) Find the exact coordinates of A, leaving the answer in the form $\left(p + q\sqrt{3},\ r + s\sqrt{3}\right)$, where p, q, r and s are integers.

(*Solutions relying on calculator technology are not acceptable.*)

(5)

(Total for Question 10 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS