5. The curve C has equation

$$y = -2x^2 + 12x + 7$$

(a) Write $-2x^2 + 12x + 7$ in the form $a(x + b)^2 + c$, where a, b and c are constants.

(3)

The point P is the maximum point on C.

(b) Find the coordinates of P.

(2)

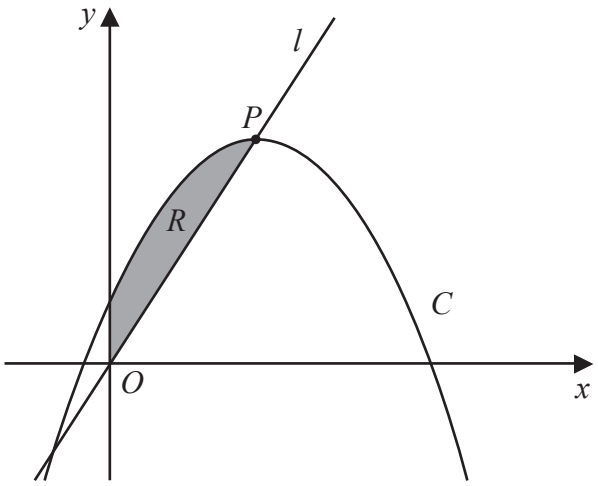

Figure 1

Figure 1 shows a sketch of the curve C and a line l.

The line l passes through the point P and the origin O.

The region R, shown shaded in Figure 1, is bounded by C, l and the y-axis.

(c) Use inequalities to define R.

(2)

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Question 5 continued

(Total for Question 5 is 7 marks)

6.

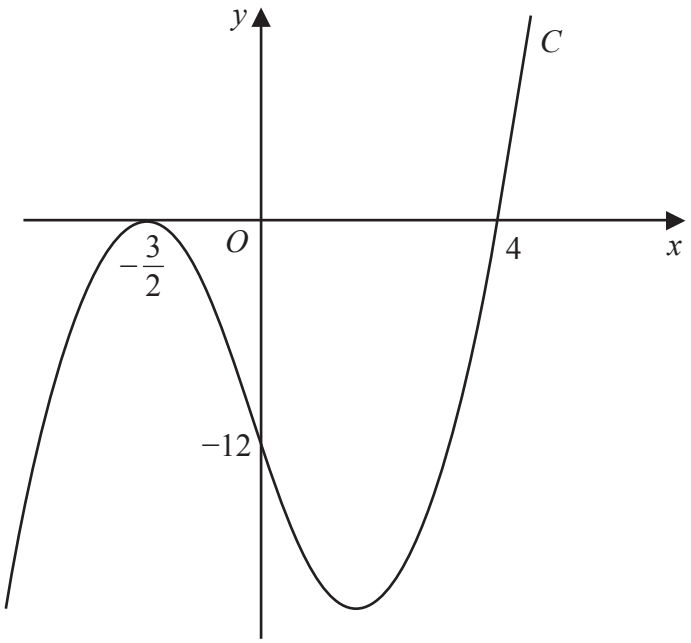

Figure 2

Figure 2 shows a sketch of the curve C with equation $y = \mathrm{f}(x)$.

The curve C

- touches the x-axis at $-\frac{3}{2}$
- cuts the x-axis at 4
- cuts the y-axis at -12

Given that $\mathrm{f}(x)$ is a cubic function,

(a) find $\mathrm{f}(x)$. You may leave the answer in a factorised form.

(3)

The line with equation $y = 2x - 12$ cuts C at $(0, -12)$ and at two further points, P and Q.

(b) Use algebra to find the exact x coordinates of P and Q.
Give each answer in simplest form.

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

(4)

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