6. The functions f and g are defined by

$$f(x) = 6 - \frac{21}{2x + 3} \qquad x \geqslant 0$$

$$g(x) = x^2 + 5 \qquad x \in \mathbb{R}$$

(a) Find gf(2)

(2)

(b) Find f^{-1}

(3)

(c) Solve the equation

$$gg(x) = 126$$

(3)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 8 marks)

7.

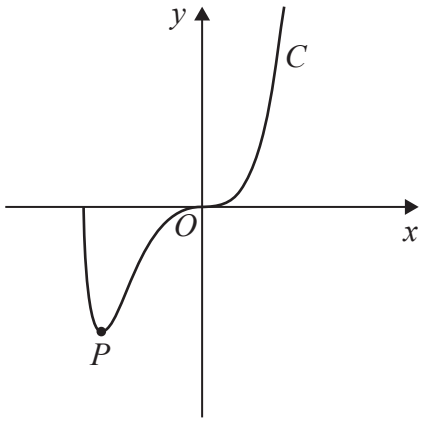


Figure 3

The curve C has equation $y = \mathrm{f}(x)$, where

$$\mathrm{f}(x) = x^3\sqrt{4x+7} \qquad x \geqslant -\frac{7}{4}$$

(a) Show that

$$\mathrm{f}'(x) = \frac{kx^2(2x+3)}{\sqrt{4x+7}}$$

where k is a constant to be found.

(4)

The point P, shown in Figure 3, is the minimum turning point on C.

(b) Find the coordinates of P.

(2)

(c) Hence find the range of the function g defined by

$$\mathrm{g}(x) = -4\,\mathrm{f}(x) \qquad x \geqslant -\frac{7}{4}$$

(2)

The point Q with coordinates $\left(\frac{1}{2}, \frac{3}{8}\right)$ lies on C.

(d) Find the coordinates of the point to which Q is mapped when C is transformed to the curve with equation

$$y = 40\,\mathrm{f}\left(x - \frac{3}{2}\right) - 8$$

(2)

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