1. The point $P(-4, -3)$ lies on the curve with equation $y = \mathrm{f}(x)$, $x \in \mathbb{R}$

Find the coordinates of the point to which P is mapped when the curve with equation $y = \mathrm{f}(x)$ is transformed to the curve with equation

(a) $y = \mathrm{f}(2x)$

(1)

(b) $y = 3\mathrm{f}(x - 5)$

(2)

(c) $y = \mathrm{f}(-x) + 3$

(2)

(Total for Question 1 is 5 marks)

2.

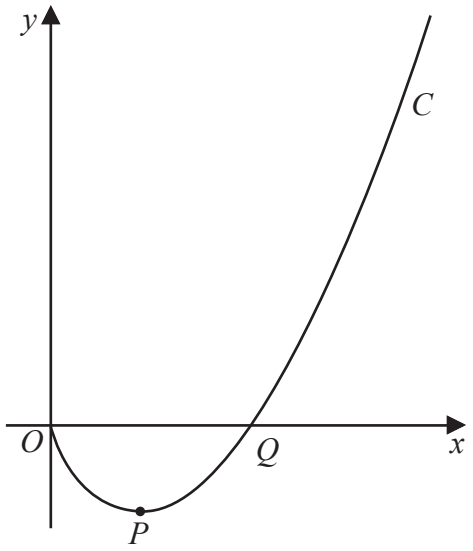


Figure 1

Figure 1 is a sketch of part of the curve C with equation

$$y = x(3 + x)\ln(2x) \qquad x > 0$$

The curve cuts the x-axis at the point Q.

(a) Find the x coordinate of Q.

(1)

The point P with x coordinate α is the stationary point on C.

(b) Show that α is a solution of

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

(4)

The iteration formula

$$x_{n+1} = \frac{1}{2}\mathrm{e}^{-\left(\frac{x_n+3}{2x_n+3}\right)}$$

is used to find an approximate value of α

Starting with $x_1 = 0.5$

(c) (i) find, to 4 decimal places, the value of x_2

(ii) find, by repeated iteration, the value of α, giving the answer to 4 decimal places.

(3)

(Total for Question 2 is 8 marks)