2.

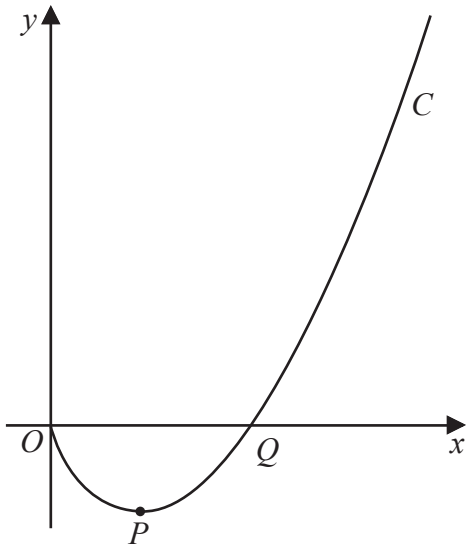


Figure 1

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)

3. The curve C has equation

$$x = \frac{2y - 1}{(y - 1)^2} \qquad x > 0 \quad y > 1$$

(a) Find $\frac{dx}{dy}$ in terms of y, giving the answer in simplest form.

(3)

The point P lies on C.

Given that P has y coordinate 2

(b) find the equation of the tangent to C at P, giving the answer in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

(Total for Question 3 is 6 marks)