

12 A curve C has equation

$$x^3 \sin y + \cos y = Ax$$

where A is a constant.

C passes through the point $P\left(\sqrt{3}, \frac{\pi}{6}\right)$

12 (a) Show that $A = 2$

[2 marks]

12 (b) (i) Show that $\frac{dy}{dx} = \frac{2 - 3x^2 \sin y}{x^3 \cos y - \sin y}$

[5 marks]

12 (b) (ii) Hence, find the gradient of the curve at P .

[2 marks]

12 (b) (iii) The tangent to C at P intersects the x -axis at Q .

Find the exact x -coordinate of Q .

[4 marks]