$$f(x) = 12e^{-\frac{x}{3}}\sin x, \qquad x \ge 0$$

(a) Show that the x coordinates of the turning points of the curve with equation y = f(x) satisfy the equation $\tan x = 3$

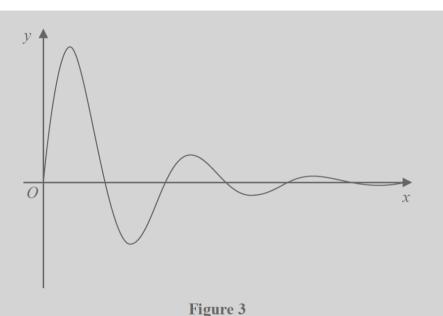


Figure 3 shows a sketch of part of the curve with equation y = f(x).

(b) Sketch the graph of H against t where

$$H(t) = \left| 12e^{-\frac{x}{3}} \sin t \right| \quad t \ge 0$$

The function H(t) is used to model the height, in metres, of a ball above the ground t seconds after it has been kicked.

Using this model, find

- (c) the maximum height of the ball above the ground between the first and second bounce. (3)
- (d) Explain why this model should not be used to predict the time of each bounce.

(Total for Question 12 is 10 marks)

(4)

(2)

(1)