12.

 $f(x) = 10e^{-0.25x} \sin x, \quad x \ge 0$ 

(a) Show that the x coordinates of the turning points of the curve with equation y = f(x)

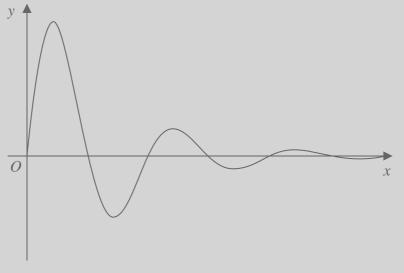


Figure 3

satisfy the equation tan x = 4

$$H(t) = \left| 10e^{-0.25t} \sin t \right| \qquad t \geqslant 0$$

showing the long-term behaviour of this curve.

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

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.

**(1)** 

**(2)** 

**(4)**