Question 15 **(5 marks)**

An object moves from the point $(0, 0)$ along the curve $y = \sqrt{3}\ \sin(x)$. The distance, D, travelled along the curve is given by

$$D(t) = \int_0^{\pi t} \sqrt{1 + 3\ \cos^2(x)}\ dx$$

where D is measured in metres and t is measured in seconds.

(a) Determine the speed $s = \dfrac{dD}{dt}$ of the object when $t = 1$. (3 marks)

(b) Use the increments formula to estimate the distance travelled by the object between $t = 1$ and $t = 1.02$. (2 marks)