Question 4 **(8 marks)**

The displacement x micrometres at time t seconds of a magnetic particle on a long straight superconductor is given by the rule $x = 5 \sin 3t$.

(a) Determine the velocity of the particle when $t = \frac{\pi}{2}$. (3 marks)

(b) Determine the rate of change of the velocity when $t = \frac{\pi}{2}$. (3 marks)

Let v = velocity of the particle at t seconds.

(c) Determine $\int_0^{\frac{\pi}{2}} \frac{dv}{dt}\, dt$. (2 marks)