5. A particle P of mass 0.5 kg moves on the x-axis under the action of a single force.

At time t seconds, $t \geqslant 0$

- $OP = x$ metres, $0 \leqslant x < \frac{\pi}{2}$
- the force has magnitude $\sin 2x$ N and is directed towards the origin O
- P is moving in the positive x direction with speed $v\,\text{m s}^{-1}$

At time $t = 0$, P passes through the origin with speed $2\,\text{m s}^{-1}$

(a) Show that $v = 2\cos x$

(6)

(b) Show that $t = \frac{1}{2}\ln\left(\sqrt{2}+1\right)$ when $x = \frac{\pi}{4}$

(5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 5 continued

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 5 continued

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 5 continued

(Total for Question 5 is 11 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA