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5. A particle P of mass 0.5 kg moves along the positive x-axis in the positive x direction.

At time t seconds, $t \geqslant 1$, P is x metres from the origin O and is moving with speed v m s^{-1}.

The resultant force acting on P has magnitude $\frac{2}{x^3}$ N and is directed towards O.

When $t = 1$, $x = 1$ and $v = 3$

Show that

(a) $v^2 = \frac{4}{x^2} + 5$

(5)

(b) $t = \frac{a + \sqrt{bx^2 + c}}{d}$, where a, b, c and d are integers to be found.

(7)

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Q5