

11 In this question the unit vectors $\mathbf{i}$ and $\mathbf{j}$ are in the directions east and north respectively.

A particle of mass 0.12 kg is moving so that its position vector $\mathbf{r}$ metres at time t seconds is given by

$$\mathbf{r} = 2t^3\mathbf{i} + (5t^2 - 4t)\mathbf{j}.$$

(a) Show that when $t = 0.7$ the bearing on which the particle is moving is approximately 044° .
[3]

(b) Find the magnitude of the resultant force acting on the particle at the instant when $t = 0.7$.
[4]

(c) Determine the times at which the particle is moving on a bearing of 045° .
[2]