8 In this question, all lengths are in metres and all times are in seconds.

A particle A is moving in the direction $\begin{pmatrix} -20 \\ 21 \end{pmatrix}$ with a speed of 58.

(a) Find the velocity vector of A. [1]

(b) Given that A is initially at the point with position vector $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$, write down the position vector of A at time t. [1]

A particle B starts to move such that its position vector at time t is $\begin{pmatrix} -35t+4 \\ 44t-2 \end{pmatrix}$.

(c) Find the displacement vector $\overrightarrow{AB}$ at time t. [2]

© UCLES 2022

(d) Hence find the distance AB, at time t, in the form $\sqrt{pt^2+qt+r}$, where p, q and r are constants.
[2]

(e) Find the value of t when the distance AB is $\sqrt{6}$, giving your answer correct to 2 decimal places.
[2]