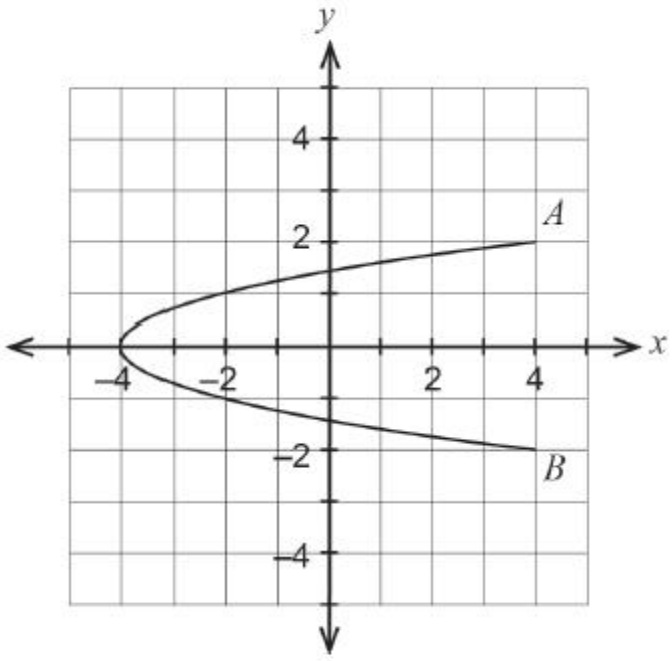
Question 16 **(10 marks)**

A particle's position vector $\underset{\sim}{r}(t)$ is given by $\underset{\sim}{r}(t) = \begin{pmatrix} 4\cos 2t \\ 2\cos t \end{pmatrix}$ centimetres where t is measured in seconds. A plot of the path of the particle is shown below.



(a) Express the path of the particle as a Cartesian equation. (3 marks)

(b) Determine the speed of the particle, correct to 0.01 cm per second, when it first reaches the point where $x = -2$. (4 marks)

(c) Write the expression, in terms of trigonometric functions, for the distance the particle will travel along its path in travelling from point A to point B. Do **not** evaluate this expression. (3 marks)