

You MAY use your calculators.

A particle moves along the y -axis so that its velocity v at time $t \geq 0$ is given by $v(t) = 1 - \tan^{-1}(e^t)$. At time $t = 0$, the particle is at $y = -1$. (Note: $\tan^{-1} x = \arctan x$)

- (a) Find the acceleration of the particle at time $t = 2$.

- (b) Is the speed of the particle increasing or decreasing at time $t = 2$? Give a reason for your answer.

- (c) Find the time $t \geq 0$ at which the particle reaches its highest point. Justify your answer.

- (d) Find the position of the particle at time $t = 2$. Is the particle moving toward the origin or away from the origin at time $t = 2$? Justify your answer.