

## BC Calculus – Calculator Active Free Response Practice 2

Name \_\_\_\_\_ Pd \_\_\_\_\_

An object moving along a curve in the  $xy$ -plane is at position  $(x(t), y(t))$  at time  $t$ , where

$$\frac{dx}{dt} = \sin^{-1}(1 - 2e^{-t}) \text{ and } \frac{dy}{dt} = \frac{4t}{1 + t^3}$$

for  $t \geq 0$ . At time  $t = 2$ , the object is at the point  $(6, -3)$ .

- Find the acceleration vector and the speed of the object at time  $t = 2$ .
- The curve has a vertical tangent line at one point. At what time is the object at this point?
- Let  $m(t)$  denote the slope of the line tangent to the curve at the point  $(x(t), y(t))$ . Write an expression for  $m(t)$  in terms of  $t$  and use it to evaluate  $\lim_{t \rightarrow \infty} m(t)$ .
- The graph of the curve has a horizontal asymptote  $y = c$ . Write, but do not evaluate, an expression involving an improper integral that represents this value  $c$ .