Module 4 Lesson 2 Assignment 1

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1 The motion of a particle is described by the set of parametric equations $x = \dfrac{t}{5} + 1, y = 2t - e^{\frac{t}{2}} + 1$ for $0 < t < 5$.

a) Find the coordinates of the absolute maximum and minimum. Justify your answer.

$$5\left(2 - \frac{e^{\frac{t}{2}}}{2}\right) = 0$$

$$\frac{5}{2}e^{\frac{t}{2}} = 10$$

$$e^{\frac{t}{2}} = 8$$

$$t = 2\ln(8)$$

b) Find the x-intercept of the line tangent to the graph at t = 2.

when $t = 2$ the x and y equal $\left(\frac{7}{5}, 5 - e\right)$

$$5\left(2 - \frac{e^{\frac{2}{2}}}{2}\right)$$

$$10 - \frac{5}{2}e$$

$$0 = \left(10 - \frac{5}{2}e\right)\left(x - \frac{7}{5}\right) + 5 - e$$

$$e - 5 = 10x - \frac{5e}{2}x - 14 + \frac{7e}{2}$$

$$9 - \frac{5e}{2} = x\left(10 - \frac{5e}{2}\right)$$

$$\frac{9 - \frac{5e}{2}}{10 - \frac{5e}{2}} = x$$

c) Find the length of the graph from $t = 0$ to $t = 5$.

$$\int_{0}^{5}\sqrt{1 + \left(10 - \frac{e^{\frac{t}{2}}}{2}\right)}\, dt$$

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