Calculus II. Quiz 10. Name Key Time____________

Show all work for full or partial credit. Put a box around your final answer in each part.

1. Given $C = \begin{cases} x = 3e^t - t \\ y = t^2 + 3 \end{cases}$ Find the points with horizontal tangent to the curve and use the second derivative to tell whether they are mins, maxes or inconclusive.

$$y' : \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \boxed{\frac{2t}{3e^t - 1}} \overset{\text{set}}{=} 0 \Rightarrow \boxed{t = 0}, \boxed{\begin{matrix} x = 3, y = 3 \\ (3,3) \end{matrix}}$$

$$y'' = \frac{dy'}{dx} = \frac{dy'/dt}{dx/dt} = \frac{\dfrac{(3e^t - 1)2 - 2t\,3e^t}{(3e^t - 1)^2}}{(3e^t - 1)} = \boxed{\frac{(3e^t - 1)2 - 2t\,3e^t}{(3e^t - 1)^3}}$$

$$= \boxed{\frac{6e^t(1-t) - 2}{(3e^t - 1)^3}} \quad \text{at} \quad t = 0,\ y'' = \frac{4}{8} = \boxed{\frac{1}{2} > 0} \Rightarrow \text{concave up} \Rightarrow \boxed{\text{min}}$$

2. Sketch the graph of $C = \begin{cases} x = -2\cos t \\ y = 2\sin t \end{cases}$ for $t \in [\pi, 5\pi/2]$.

$$\begin{cases} \dfrac{x}{-2} = \cos t \\ \dfrac{y}{2} = \sin t \end{cases} \Rightarrow \begin{cases} \dfrac{x^2}{4} = \cos^2 t \\ \dfrac{y^2}{4} = \sin^2 t \end{cases} \Rightarrow \frac{x^2}{4} + \frac{y^2}{4} = 1 = x^2 + y^2 = 4$$

t	x	y
π	2	0
3π/2	0	-2
2π	-2	0
5π/2	0	2