

Name: _____

/ 25

30 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. [8 points] Consider the parametric curve

$$x(t) = 5 \cos t, \quad y(t) = \sin t$$

- a. Determine the slope and the equation of the tangent line at $t = \pi/2$.

(slope) =

equation:

- b. Eliminate the parameter t to write the curve in rectangular form.

2. [5 points] Fully set up, but do not evaluate, an integral for the length of the spiral curve $x(t) = t \cos t$, $y(t) = t \sin t$ from $t = 0$ to $t = 2\pi$.

3. [5 points] Find $\frac{d^2y}{dx^2}$:

$$x = t^2 - t, \quad y = t + e^t$$

4. [7 points] Find the area under one hump of the cycloid

$$x(t) = 2(t - \sin t), \quad y(t) = 2(1 - \cos t)$$

(Hint. One hump goes from $t = 0$ to the next t where $y(t) = 0$.)

EC. [1 points] (Extra Credit) Eliminate the parameter to write the curve $x(t) = \sin(2t)$, $y(t) = 2 \sin t$ in rectangular form.

EXTRA SPACE FOR ANSWERS