PARAMETRIC EQUATIONS

BLAKE FARMAN

Lafayette College

Name: ______________________________

Sketch the curve by using parametric equations to plot points. Indicate with an arrow the direction in which the curve is traced as t increases.

1. $x = 1 - t^2$, $y = 2t - t^2$, $-1 \leq t \leq 2$.

2. $x = t + \sin(t)$, $y = \cos(t)$, $-\pi \leq t \leq \pi$.

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3. Eliminate the parameter to find a Cartesian equation of the curve. Sketch the curve and indicate the direction in which the curve is traced as the parameter increases.

$$x = e^t,\ y = e^{-2t}.$$

4. Find an equation of the tangent to the curve at the point corresponding to the given value of the parameter.

$$x = \sqrt{t},\ y = t^2 - 2t,\ t = 4.$$

5. Use the formula

$$L = \int_{\alpha}^{\beta} \sqrt{\left(\frac{\mathrm{d}x}{\mathrm{d}t}\right)^2 + \left(\frac{\mathrm{d}y}{\mathrm{d}t}\right)^2}\,\mathrm{d}t$$

to find the length of the curve

$$x = e^t - t,\ y = 4e^{t/2},\ 0 \le t \le 2$$

6. Use the formula

$$S = \int_{\alpha}^{\beta} 2\pi y \sqrt{\left(\frac{\mathrm{d}x}{\mathrm{d}t}\right)^2 + \left(\frac{\mathrm{d}y}{\mathrm{d}t}\right)^2}\, \mathrm{d}t$$

to find the area of the surface obtained by rotating the curve about the x-axis

$$x = t^3,\ y = t^2,\ 0 \le t \le 1$$