

MATH 1101/2 (Ng/Fall 2004)

**Handout for slopes of tangent lines in Parametric & Polar Equations
December 8, 2004.**

Problems for slopes of tangent lines in Parametric & Polar Eq.

- a. For the following parametric curves, find the slope of the tangent line to the curve at the given points and the equation of the tangent line to the curve at that point.

In addition, for the odd numbered problems, find the second order derivatives, $\frac{d^2y}{dx^2}$ as a function of t .

1. $\{x = 4t^2; y = 16t\}$ at $t = 1$.
2. $\{x = 2 \sin t; y = 3 \cos t\}$ at $t = \frac{\pi}{4}$.
3. $\{x = t + 1; y = t^3 + 1\}$ at $t = 0$.
4. $\{x = \sqrt{t}; y = 1 - t\}$ at $t = 9$.
5. $\{x = \sin^2 t; y = \cos^2 t\}$ at $t = \frac{\pi}{6}$.
6. $\{x = 3 \sec t; y = 2 \tan t\}$ at $t = \frac{\pi}{4}$.
7. $\{x = e^t; y = e^{-t}\}$ at $t = 0$.
8. $\{x = e^t; y = e^t\}$ at $t = 0$.

- b. For the following polar curves, find the slope of the tangent line to the curve at the given points. In addition, for the odd numbered problems, find the equation of the tangent line to the curve at that point.

1. $r = 2 \sin(\theta)$ at $\theta = \frac{\pi}{6}$.
2. $r = \cos(\theta) - \sin(\theta)$ at $\theta = \frac{2\pi}{3}$.
3. $r = e^\theta$ at $\theta = \frac{5\pi}{6}$.
4. $r = 2 \cos(3\theta)$ at $\theta = \frac{\pi}{4}$.
5. $r = 2 \cos(4\theta)$ at $\theta = \frac{\pi}{6}$.

F.Y.I.:

For all of the above problems, you should feel free and comfortable to use *Mathematica* as a tool to either help in solving the problems or to verify the plausibility of your answers - especially by looking at the graphs.