Math 106, Sect. 350 **Answers to Quiz # 5** **28 Sept '06**

. 5 1. Suppose that $f(x)$, $g(x)$ and their derivatives have the following values:

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	1	3	4	2
3	0	2	1	8

Find the derivative of $f(g(x))$ with respect to x at $x = 3$.

Solution. Using the chain rule, $\frac{d}{dx}(f(g(x)) = f'(g(x)) \cdot g'(x)$.
Substituting 3 for x, we have

$$\frac{d}{dx}(f(g(x))\bigg|_{x=3} = f'(g(3)) \cdot g'(3) = f'(2) \cdot 8 = 4 \cdot 8 = 32.$$

. 5 2. Find the equation for the line tangent to the following curve at the point defined by the given value of t.

$$x = 3\cos t, \quad y = -3\sin t, \quad t = \pi/3$$

Solution. Since the slope of a tangent line is equal to the derivative $\frac{dy}{dx}$, we use the parametric formula to find $\frac{dy}{dx}$:

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{-3\cos t}{-3\sin t} = \cot t$$

When $t = \pi/3$, the slope is equal to $\cot(\pi/3) = \sqrt{3}/3$.
The point on the curve defined by $t = \pi/3$ is

$$(x, y) = (3\cos(\pi/3), -3\sin(\pi/3)) = (3/2, -3\sqrt{3}/2)$$

Therefore, the equation of the tangent line through the point $(3/2, -3\sqrt{3}/2)$ with the slope $\sqrt{3}/3$ is

$$y - (-3\sqrt{3}/2) = (\sqrt{3}/3)(x - 3/2)$$

which simplifies to $y = (\sqrt{3}/3)x - 2\sqrt{3}$. .