Fall 2009 Math 151

Week in Review VI

courtesy: David J. Manuel

(covering 3.5, 3.6, 3.7)

1 Section 3.5

1. Find the derivatives of the following:
   (a) $f(x) = (x^3 - 4)^{10}$
   (b) $y = \cos^3(2x)$
   (c) $f(x) = \dfrac{(2x+3)^3}{(4x^2-1)^8}$
   (d) $y = (1 + x^5 \cot x)^{-8}$
2. "Chain Rule" Maplet*
3. Given functions f and g such that $f(4) = 2$, $f'(4) = -2$, $g(1) = 4$, $g'(1) = 3$, find $h'(1)$ if $h(x) = f(g(x))$.

2 Section 3.6

1. Find $\dfrac{dy}{dx}$ implicitly if $x^2y = 1$. Then solve for y, differentiate, and show you get the same answer.
2. Find the slope of the line tangent to $\sec(x+y) - \tan(x-y) = 1$ at the point (π, π).
3. "Implicit Differentiation" Maplet*
4. Show that the curves $x^2 + y^2 = 4x$ and $x^2 + y^2 = 2y$ are orthogonal.
5. The equations $x^2 + y^2 = r^2$ and $y = mx$ represent **families of curves** for different constants r and m. Show that these families of curves are orthogonal.

3 Section 3.7

1. Find the velocity and speed for the curve $\mathbf{r}(t) = (4\sin t)\mathbf{i} + (4\cos t)\mathbf{j}$ at the point $(2, -2\sqrt{3})$.
2. Find a unit tangent vector for the curve $\mathbf{r}(t) = (t\cos 2t)\mathbf{i} + (t\sin 2t)\mathbf{j}$ at the point where $t = \pi$.
3. Given the position function of an object is $\mathbf{r}(t) = (4\cos t)\mathbf{i} - (3\sin t)\mathbf{j}$, find $\mathbf{r}(0)$ and $\mathbf{r}'(0)$ and use these to describe the motion of the object.
4. The graphs of $\mathbf{r_1}(t) = t^2\mathbf{i} + t^3\mathbf{j}$ and $\mathbf{r_2}(t) = <\sqrt{2}\cos t, \sqrt{2}\sin t>$ intersect at the point $(1, 1)$. Find the angle of intersection to the nearest degree.

*-Maplets located at
http://calclab.math.tamu.edu/maple/maplets/
(only works on OAL machine, Calclab machine, or any machine with Maple installed on it)