Math 151 Sample Test II Questions Thu, 20/Oct/2005

This is meant to be a rough sampling of the type of questions that may be on your exam. Please work through these during the next couple of days. We will go over the questions on Mon/Wed the following week. Do not use calculators, as you will not be able to use them on the exam.
GOOD LUCK !

1. Let $y = f(u)$ and $u = g(x)$. Find $\left.\dfrac{dy}{dx}\right|_{x=0}$ using the following information

   $$g'(0) = 2,\ g'(1) = -3,\ g(0) = 2,\ g(1) = -5,\ f'(1) = 1,\ f'(2) = 6,\ f(0) = 1,\ f(1) = 2.$$

2. Approximate $\sqrt{3}$ by using the quadratic approximation of $f(x) = \sqrt{x}$ at $x = 4$.

3. Find $\lim\limits_{x\to 0} \dfrac{x}{3\tan(x)}$.

4. Find the equation of the line tangent to the curve $e^y \sin(xy) + x^2 + y = 1$ at $(0,1)$.

5. Consider $x(t) = t^3 + t$, $y(t) = 2t^3 - 1$.

   (a) Find all vertical tangent lines.

   (b) Find all horizontal tangent lines.

   (c) Find all values of t where the tangent line makes a 45° angle with the positive x axis.

6. The graph of a differentiable function f passes through the point $(1,1)$. If you perform one step of Newton's Method with a starting guess of $x_1 = 1$ then you find $x_2 = 3/2$. What is the slope of the line tangent to f at $(1,1)$?

7. Consider $f(x) = e^{x^2}$, $x \geq 0$.

   (a) Find the inverse of $f(x)$.

   (b) Find $g'(e)$ where g is the inverse function of $f(x)$.

8. Consider the movement of a particle whose position at time t seconds is given by $r(t) = \left[t\sin t, t^2 + 2t\right]$ meters.

   (a) Find the velocity ($v(t)$) and the acceleration ($a(t)$) of the particle.

   (b) Find the speed of the particle at $t = \pi/2$.

9. Gravel is being dumped from a conveyor belt at a rate of 10 ft^3/min and its coarseness is such that it forms a pile in the shape of a cone whose base diameter and height are always equal. How fast is the height of the pile increasing when the pile is 10 ft high?