MA 125 Test 2 Name_____
100 points Spring 2012

Part 1 **Part 1 consists of 6 questions. Clearly write your answer in the space provided after each question Show all work for full credit. (5 points each)**

1. Differentiate the function $f(x) = -2x^3 + \frac{3}{x^2} + x - \sqrt{2}$. (You do not need to simplify the derivative.)

2. For what value(s) of x does the curve $y = 3x^4 - 2x^3$ have a horizontal tangent?

3. Find the equation of the tangent line to the curve $y = \sqrt{x}$ at the point where $x = 25$.

4. Find the second derivative y'' when $y = \cos(x^2)$

5. In the triangle below, z is changing at a rate of 3 in/sec. This causes x and y to change with time *t*. What is dy/dt? dx/dt?

6. Find the derivative of $y = \dfrac{x - \sin x}{1 + \cos x}$ and simplify your answer.

<u>Part 2</u>. Part 2 consists of 5 problems worth 14 points apiece. You must show your work on this part of the test to get full credit. Displaying only the final answer (even if correct) without the relevant steps is not enough.

1. a. Find the derivative of $f(x) = (x+2)^4(x-1)^5$. Your answer should be fully factored.

b. Find the derivative of $f(x) = \dfrac{x}{\sqrt{1-x^2}}$. Express your answer using just positive exponents and as a single fraction.

2. An object is moving along a horizontal coordinate line according to the formula $s = t^3 - 9t^2 + 24t + 1$, $t \geq 0$, where the position s is in feet and time t is in seconds.

(a) What are $v(t)$ and $a(t)$, the velocity and acceleration, at time t?

(b) When is the object moving to the right (that is, in the positive direction)?

(c) When is the object moving to the left (that is, in the negative direction)?

(d) Draw a schematic diagram that shows the motion along the horizontal line.

3. Differentiate the following two functions. Simplify your answer as much as possible.

a. $y = (\cos x)^3 + \tan(3x)$

b. $f(x) = \left(\frac{x^2}{x-2} \right)^6$

4. Use implicit differentiation to find the following:

a. dy/dx if y is related to x by the equation $y^3 + 7y = x^3$

b. the equation of the tangent line to the curve $y + \cos(xy^2) + 3x^2 = 4$ at (1, 0)

5. Ship A is traveling directly north away from an island port at 24 knots (24 nautical miles per hour) while Ship B is traveling directly west toward the port at 30 knots. How fast is the distance between The ships changing when A is 12 nautical miles from the port and B is 5 nautical miles from port?