NAME _____ SECTION _____

MIDTERM II

Math 124, Section C

May 16, 2006

Problem	Total Points	Score
1	12	
2	12	
3	12	
4	12	
5	12	
Total	60	
6(Bonus)	2	

- No book, notes or graphing calculators are allowed. You may use a scientific calculator.

- Show all your work to get full credit.

- Read instructions for each problem CAREFULLY.

- Check your work!

1. (12pts) Find the following derivatives. You do not have to simplify.

(a) $f(x) = \tan(\frac{x^4}{\sqrt[4]{17x^3+1}})$, $\quad f(x)' =$

(b) $f(x) = x^{\cos x}$, $\quad f(x)' =$

(c) $y = arccos(t)$, $\quad \frac{d^2y}{dt^2} =$

2. (12pts) A (spherical) snowball is rolling down a snow covered hill in such a way that its radius is changing at the rate of 3 cm/min. Determine the rate of change of the volume of the snowball when the radius is 4 cm. Include units.

   (You may use the formula for the volume of a sphere of radius r: $V = \frac{4}{3}\pi r^3$.)

3. (12pts) Consider the curve given by the equation

$$y^2 = (x+1)(x^2 - 1/2)$$

Use implicit differentiation to answer the following questions:

(a) Find all values of x such that the tangent line to the curve at the point (x, y) is horizontal. How many such points are on the curve?

Note: you do not have to compute the values of y.

(b) Find all points (x, y) on the curve where the tangent line is vertical.

4. (a) Find an equation of the tangent line to graph of the function $y = \sqrt[4]{x}$ at the point $(16, 2)$.

(b) Using linear approximation, estimate $\sqrt[4]{17}$.

(c) Is your estimate below or above the actual value? Give a short graphical explanation.

5. A particle starts moving at the time $t = 0$. Its position at the time t is given by the parametric equations

$$x(t) = \frac{2t}{t^2 + 1}, \quad y(t) = \frac{t^2 - 1}{t^2 + 1}$$

(a) Find the coordinates of the position of the particle at the time $t = 2$.

(b) Compute horizontal and vertical velocities of the particle.

(c) Compute $\frac{dy}{dx}$ as a function of t.

(d) Find an equation of the tangent line to the trajectory at the time $t = 2$.

(e) Show that the tangent line at the point $(x(2), y(2))$ is perpendicular to the line connecting the origin with the point $(x(2), y(2))$.

6. (2pt) Bonus. Sketch and name the parametric curve in problem 5. Justify your answer. FULL CREDIT ONLY.