Math 124 (Pezzoli)
Spring 2013
Midterm #2 (70 points)

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Name _____

TA: _____

Section: _____

Instructions:

- Your exam contains 4 problems. The entire exam is worth 70 points.
- Your exam should contain 6 pages; please make sure you have a complete exam.
- Box in your final answer when appropriate.
- Your work needs to be neat and legible.
- You **MUST** show work for credit. No credit for answers only.
- Unless otherwise instructed, ALWAYS GIVE YOUR ANSWERS IN EXACT FORM. For example, $\pi, \sqrt{2}, \ln(2)$ are in exact form; the corresponding approximations $3.1415, 1.4142, 0.6931$ are NOT in exact form.
- You are allowed one 8.5×11 sheet of notes (both sides). Graphing calculators are NOT allowed; scientific calculators, with no calculus capabilities are allowed. Make sure your calculator is in radian mode.

Problem #1 (15 pts) _____

Problem #2 (15 pts) _____

Problem #3 (25 pts) _____

Problem #4 (15 pts) _____

TOTAL (70 pts) _____

Problem 1 : Compute the derivatives of the following functions. You do not need to simplify.

a) (5 points) $f(x) = (\arctan(x) + 3)^5$, $\frac{df}{dx} =$

b) (5 points) $g(x) = \sin(\cos(\tan(x))) \cdot \ln x$, $\frac{dg}{dx} =$

c) (5 points) $h(x) = (2x)^{\ln(x)}$, $\frac{dh}{dx} =$

Problem 2 (15 points) : Consider the curve C of equation $2x^2 + xy + y^2 = 14$. Find the equations of all lines tangent to C that pass through the point $P=$ (6,4) . (Hint: is P on C ?)

Problem 3 A curve C has parametric equations:

$$x = \sin t$$
$$y = t^3 - 3t + 1$$

for $-\infty < t < \infty$.

a) (6 points) Find the coordinates of all points Q on C where the tangent is horizontal.

b) (7 points) Find the coordinates of one point R on C where the tangent is vertical.

(problem 3 continued)

c) (12 points) For $t = 0$ we get the point $P = (0, 1)$ on C. Write the equation of the tangent line to C at P and use linear approximation to estimate the x coordinate of a point $R = (x, 0.9)$ on C.

Problem 4 : (15 points) Consider the right triangle ABC. Vertexes A and C are fixed and the length of the side AC is 3 m. Vertex B is moving along the straight line AD in such a way that the angle θ increases at a constant rate of 0.5 rad/sec. How fast (in m/sec) is the length of the side BC changing when $\theta = \frac{\pi}{4}$?