

NAME: _____

Student ID #: _____

QUIZ SECTION: _____

Math 124 A & B
Midterm II
February 24, 2009

Problem 1	13	
Problem 2	12	
Problem 3	10	
Problem 4	7	
Problem 5	8	
Total:	50	

- Your exam should contain 5 problems on 4 pages. Check that you have a complete exam!
- Unless otherwise instructed, **show all your work**. Answers with no supporting work, or obtained by guess-and-check, will result in little or no credit, even if correct.
- Indicate your **final answer** by placing a box around it.
- Unless otherwise indicated, **leave your answers in exact form** instead of a decimal approximation. That is, $\sqrt{2}$ instead of 1.4142, and $\frac{\pi}{2}$ instead of 1.57. Simplify all you can.
- If you need more room, use the backs of pages, but indicate to the grader that you have done so.
- Raise your hand if you have any questions.

GOOD LUCK!

Do you want your grades so far posted on our class website, in about 1 week, by last 4 digits of your student ID?

Yes, please post my grade. Sign to give permission: _____

No, please don't post my grades.

1 (13 points) Compute the derivatives of the following functions. No need to simplify your answers.

a) $f(t) = (t^2 + 5) \arctan(3t)$

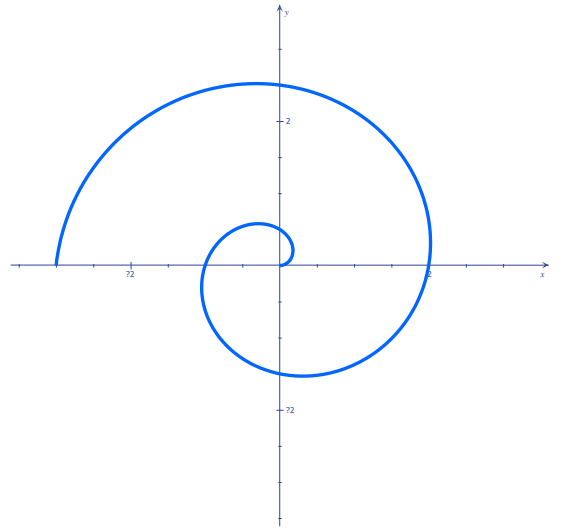
b) $g(x) = \ln(x - \sqrt{1 + x^2})$

c) $y = \left(\frac{1}{x}\right)^{\sec x}$

2 (12 points) Consider the spiral curve given by the following parametric equations, with $0 \leq t \leq 3$:

$$\begin{cases} x(t) = t \cos(\pi t) \\ y(t) = t \sin(\pi t) \end{cases}$$

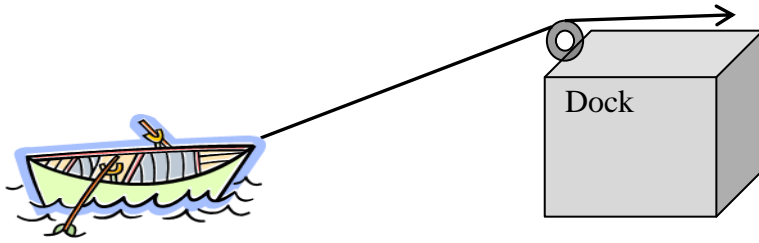
a) Compute the horizontal and vertical velocities (as functions of t).



b) Compute the equation of the tangent line to this curve at the point corresponding to $t = 1$.

c) Find **all** times t , $0 \leq t \leq 3$, at which the curve crosses the y -axis.

3 (10 points) A boat is pulled towards a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 2 m higher than the bow of the boat. If the rope is pulled in at a rate of 1.5 m/sec, how fast is the boat approaching the dock when it is 6 m from the dock?



4 (7 points) Let $f(x) = (1 + x)^n$, where n is a constant.

a) Compute the linearization of $f(x)$ at $x = 0$. Your answer will depend on n .

b) Use the linearization you found in part (a) to approximate $\sqrt[3]{1.009}$. Show all work, not just the final answer.

5 (8 points) Consider the cardioid curve given by the equation:

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

Find the equation of the tangent line to this curve at the point $(0, -\frac{1}{2})$.

