Mth 201A
Hour Exam 2

Name: _____ Date: _____

10 Problems. 100 Points. Follow directions carefully. Please do not leave any question blank, and turn off cell phones and other noisemakers to avoid disturbing your classmates.

I have verified that this exam contains 10 problems and 7 printed pages. Initial____.

Print the name of the people sitting either side of you :- _____

Short Answer (7 points each) - Minimal explanation and calculations necessary though where appropriate, answers should be exact.

1. For the following **four** questions, you must do the following **two** things:

   i) Differentiate the function

   ii) Justify how you got the derivative by writing the letters - P=Product, Q=Quotient, C=Chain and N=None - for each rule required to differentiate the given function (if more than one rule is required, state all rules required and if none are used, write N). WARNING: You will loose points for stating rules which are not used!

   (a)
   $$f(x) = \frac{x}{x+1}$$

(b)

$$f(x) = e^x \ln(x)$$

(c)

$$f(x) = \sin(2x + 1)$$

(d)

$$f(x) = 2\sqrt{x} + \frac{2}{\sqrt{x}}$$

2. Find $\frac{dy}{dx}$ where

$$x^2 + \frac{y^2}{2} = 2xy.$$

3. Find $f'(1)$ where

$$f(x) = \frac{x}{49} + \frac{\pi^e}{\sqrt{2}} + \ln\left(\sqrt{2}\right)^2 - 5x^2$$

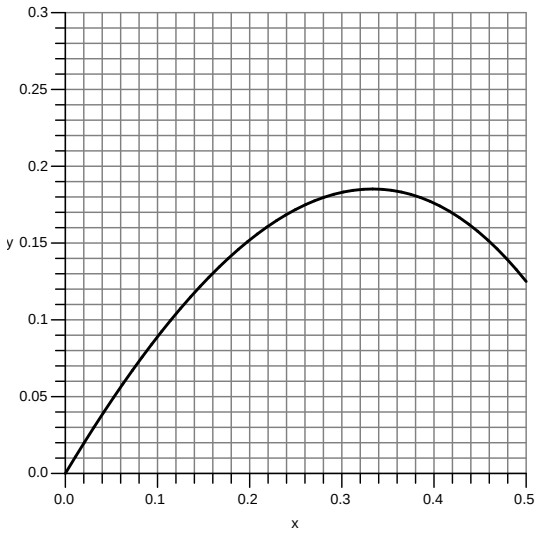
.

4. Find the equation to the tangent line to $f(x) = x^x$ at $x = 2$.

Long Answer (17 points each) - show work and provide explanations, an answer without supporting work will not receive credit.

1. At noon, ship A is 40 miles due west of ship B. Ship A is sailing west at 20mph and ship B is sailing north at 18mph. How fast (in mph) is the distance between the ships changing at 3 PM?

2. Suppose that the graph of a function $y = f(x)$ is given below.



(a) Determine the linear approximation to $f(x)$ at $x = 0.4$ (explaining your answer).

(b) Use your answer to approximate the value of $f(6)$ and based on the graph, explain whether you think this is a good approximation or a bad approximation. (WARNING:The question continues over the page)

(c) Is $f''(0.4)$ positive or negative? Explain.

(d) (EXTRA CREDIT) Find the quadratic approximation to $f(x)$ at $x = 0.4$.

Suppose the values of $f(x)$, $g(x)$, $f'(x)$ and $g'(x)$ are given below. Calculate the following derivatives providing all calculations (WARNING: The question continues over the page).

	-3	-2	-1	0	1	2	3
f	0	6	9	4	3	1	2
f'	-1	8	2	6	5	0	9
g	18	5	5	16	9	-1	1
g'	17	12	11	4	2	3	8

(a)

$$(f \circ g)'(2)$$

(b)

$$(\ln(f))'(3)$$

(c)

$$(g \circ f)'(-3)$$

(d)

$$(f \cdot g)'(-1)$$

(the product of f and g).

(e)

$$(\frac{f}{g})'(1)$$