

TEST 2

Math 105
3/16/12

Name: _____

by writing my name I swear this work is my own

Read all of the following information before starting the exam:

- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- This test has 6 problems and is worth 100 points, It is your responsibility to make sure that you have all of the pages!
- Good luck!

1. (14 points)

x	$f(x)$	$g(x)$	$j(x)$	$f'(x)$	$g'(x)$	$j'(x)$
-2	0	1	-1	3	2	1
-1	1	3	2	-1	3	-2
0	2	1	1	2	-2	2
1	3	1	-1	0	3	1
2	-2	2	1	3	0	3
3	-1	1	-1	1	-2	0

a. (7 pts) $H(x) = f(j(x)) + 2g(x)$. Find $H'(2)$.

b. (7 pts) $F(x) = \frac{xj(x)}{f(x)^2}$. Find $F'(0)$.

2. (21 points) Find y' in **3** of **4** of the following. If you do more than four, then clearly mark which three you want graded. If you don't, the worst three will be chosen for you.

1. $y = \frac{\sin^4(x) \tan^2(x)}{(x^2 + 1)^2}$ using logarithmic differentiation

2. $y = \log_6(x^2 e^x)$

3. $y = \arcsin(x^2 - 1) + 4\pi^2 + \sqrt[3]{x^2}$

4. $y = \frac{\arctan(2x)}{x^2 + 1} + e^3$

3. (12 points)

a. (8 pts) For the equation $e^{xy} = (x - 2y)^2$ use implicit differentiation to find $\frac{dy}{dx}$.

b. (4 pts) Determine $\frac{dy}{dx}$ at the point (1,0).

4. (12 points) Find an antiderivative of the given function using an educated guess and check.

a. (6 pts) $f(x) = \frac{4}{9 + x^2}$.

b. (6 pts) $g(x) = \frac{2 \sin x \cos x}{1 + \sin^2 x}$.

5. (20 points) Evaluate the following limits. Only use L'Hôpital's rule when appropriate. Show your work!!

a. (5 pts) $\lim_{x \rightarrow \infty} \frac{1}{x} (\ln x)^2$

b. (5 pts) $\lim_{x \rightarrow 0} \frac{4x^2 + 2x + 1}{3x^2 + 1}$

c. (5 pts) $\lim_{x \rightarrow \infty} \frac{4x^2 + 2x + 1}{3x^2 + 1}$

d. (5 pts) $\lim_{x \rightarrow \infty} x^{\frac{1}{\ln(x)}}$

6. (21 points) Speeders Beware!

It has been found that for every 5mph you travel over 55mph, you decrease your gas mileage by 7%. You are renting a car for a 400 mile trip. The car rental costs \$15/hour. Gas is \$4.25/gallon.

When traveling up to 55mph the gas mileage is 27miles/gallon. After 55mph, the car's gas mileage drops by 7% for each 5mph over 55mph.

a. (2 pts) If you travel at a constant speed of 55mph, how many hours will you travel to complete the trip?

b. (3 pts) How much would the trip cost if you travelled 55mph the entire trip?

c. (7 pts) You would like to minimize the cost on a trip with constant speed. Write the function for cost.

d. (3 pts) What is the constraint?

e. (3 pts) Write the objective function in terms of a single variable and simplify as much as possible.

f. (3 pts) Describe, DO NOT CALCULATE, how you would finish the problem.