

MARK BOX		
PROBLEM	POINTS	
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
%	100	

NAME: _____

SSN: _____

Section 007 (MW 12:20 pm)

or

Section 008 (MW 2:30 pm)

INSTRUCTIONS:

- (1) To receive credit you must:
 - (a) work in a logical fashion, show all your work, indicate your reasoning
 - (b) when applicable put your answer on/in the line/box provided
 - (c) if no such line/box is provided, then box your answer
- (2) The MARK BOX indicates the problems along with their points. Check that your copy of the exam has all of the problems.
- (3) You may **not** use a calculator, books, personal notes. Give exact answers: for example, write $\ln 2$ instead of .6931, write $\sqrt{2}$ instead of 1.414, write π instead of 3.1415, write $\frac{1}{3}$ instead of 0.3333.
- (4) During this exam, do not leave your seat. If you have a question, raise your hand. When you finish: turn your exam over, put your pencil down, and raise your hand.
- (5) This exam covers (from *Calculus* by Varberg, Purcell, Rigdon, 8th ed.): Chapter 7 (excluding 7.6) .

Problem Inspiration:

1. Prof. Kustin's Fall 2001 Exam 1 # 5
 2. homework problem § 7.4 # 7 (but with the numbers changed)
 3. homework problem § 7.7 # 25 (but slightly modified)
 4. similar to an example from class
 5. Prof. Girardi's Spring 2003 Exam 1 # 4
 6. homework problem § 7.1 # 19
 7. homework problem § 7.3 # 29
 8. homework problem § 7.3 # 37
 9. like homework problems § 7.5 # 1 & 3
 10. Prof. Girardi's Spring 2003 Exam 1 # 10 (but with the numbers changed).
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1. Let $f(x) = x^2 + 2x$ for $x \leq -1$.

1a. Find the inverse function of $y = f(x)$. Answer: $f^{-1}(x) =$ _____

Hint: useful might be the quadratic formula or completing the square.

1b. Sketch the graph of $y = f(x)$ and $y = f^{-1}(x)$ on the same grid, **clearly labeling which graph is which**. Explain how you got the graph of $y = f^{-1}(x)$ from the graph of $y = f(x)$.

1c. The domain of $y = f^{-1}(x)$ is _____

2. Solve the equation

$$\log_2(x + 4) - \log_2 x = 3$$

for x . Your answer should **not** have a logarithm nor exponential in it.

ANSWER: $x =$

3. Simplify $\sin\left(2 \arccos\left(-\frac{3}{5}\right)\right)$. Your answer should be a rational number.

ANSWER: $\sin\left(2 \arccos\left(-\frac{3}{5}\right)\right) =$

For this test I'll remind you that $\sin(2\theta) = 2 \sin \theta \cos \theta$ but you better know this by the next test!

4a.

$$D_x \left[(3x + 1)^2 \right] =$$

4b.

$$D_x \left[2^{(3x+1)} \right] =$$

4c.

$$D_x \left[(3x + 1)^x \right] =$$

5.

$$D_x [3 \ln (1 + e^{5x})] =$$

6.

$$\int \frac{2 \ln x}{x} dx = \quad \quad \quad + C$$

7.

$$\int e^{(3x+1)} dx = \quad \quad \quad + C$$

8. The volume of the solid generated by revolving the region bounded by:

$$y = e^x \quad \text{and} \quad \text{the } x\text{-axis} \quad \text{and} \quad \text{the } y\text{-axis} \quad \text{and} \quad x = \ln 3$$

about the x -axis is

Your answer should **not** have a logarithm nor exponential in it.

9. The solution to the differential equation

$$\frac{dy}{dt} = -6y(t)$$

subject to the condition that $y(2) = 7$ is $y(t) =$

You may assume that the $y(t) \geq 0$ for each t .

10. The rate of decay of a radioactive substance is proportional to the amount of such substance present. Today we have 10 grams of a radioactive substance. Given that one-third of the substance decays every 8 years, how much will be left t years from today? *Clearly explain your notation.*

ANSWER:

grams