Math 16B
Kouba
Practice Exam 1

Print your name here. _____ Your exam ID # _____

1. **PLEASE DO NOT TURN THIS PAGE UNTIL TOLD TO DO SO.**

2. No notes, books, or classmates may be used as resources for this exam. It is a violation of the University honor code to, in any way, assist another person in the completion of this exam. Please keep your own work covered up as much as possible during the exam so that others will not be tempted or distracted. Thank you for your cooperation.

3. Read directions to each problem carefully. Show all work for full credit. In most cases, a correct answer with no supporting work will not receive full credit. The best way to get maximum partial credit is to write neatly and be organized.

4. Make sure that you have seven (7) pages, including the cover page.

5. Include units on answers where units are appropriate.

6. YOU WILL BE GRADED ON PROPER USE OF integral ($\int$), dx, and du notation.

7. You have until 8:50 a.m. to complete the exam.

8. There are 5280 feet in a mile.

1.) (1 pt. each) Determine whether each statement is true (T) or false (F), then circle the appropriate response. Assume that x and y are positive numbers.

a.) $\ln(x+y) = \ln x + \ln y$ T F

b.) $\ln(x/y) = \ln x - \ln y$ T F

c.) $\ln(xy) = \ln x + \ln y$ T F

d.) $(\ln x)(\ln y) = \ln(xy)$ T F

e.) $\frac{\ln x}{\ln y} = \ln(x/y)$ T F

f.) $\frac{\ln x}{\ln y} = \ln x - \ln y$ T F

g.) $e^x e^y = e^{xy}$ T F

h.) $\frac{e^x}{e^y} = e^x - e^y$ T F

i.) $e^{x+y} = e^x e^y$ T F

j.) $\frac{e^x}{e^y} = e^{x-y}$ T F

2.) (10 pts.) A portion of fossilized tree contains 8.5% of its original amount of carbon-14, which has a half-life of about 5730 years. Assuming exponential decay, estimate the age of the fossil.

3.) (10 pts.) Determine an equation of the line perpendicular to the graph of $y = \dfrac{8e^{-x}}{x+4}$ at $x = 0$.

4.) (10 pts.) Find the function $f(x)$ which has the following properties : $f''(x) = 2x + 12x^2$, $f'(0) = 10$, $f(0) = 50$.

5.) (8 pts.) Determine all relative maximum and minimum points (x, y) for $f(x) = x^2 e^{-x}$.

6.) (8 pts.) Determine all inflection points (x, y) for $y = x^2 + 2 \ln (x + 1)$.

7.) (8 pts.) Use implicit differentiation to find y ' = dy/dx.

$2^x + \log_3 y = y^3 + x^2$

8.) (6 pts.) Assume that $\int f(x)\,dx = \sin(7x) + C$. Determine $f''(x)$. Think carefully. This is not a difficult problem.

9.) (10 pts.) You open two savings accounts at your bank. In account AA you deposit \$500 earning 7% annual interest compounded monthly. In account BB you deposit \$400 earning 8% annual interest compounded continuously.

a.) After 10 years which account has more money ? How much more money ?

b.) After 50 years which account has more money ? How much more money ?

10.) (5 pts. each) Determine the following indefinite integrals.

a.) $\int x^5 (x^2 - 1)\,dx$

b.) $\int x\,(x^2 - 1)^5\,dx$

c.) $\int (7x + 1)^{3/2}\,dx$

d.) $\int \frac{e^x}{\sqrt{4 + e^x}}\,dx$

EXTRA CREDIT PROBLEMS-- Each of the following problems is worth 10 extra credit points. These problems are optional.

1.) Find the inverse function for $f(x) = 2\ln(3x + 1) - \ln(2 - x)^2$

2.) The population of Tumbleweed, Colorado, is presently 2358. The population in 10 years is expected to be 4000. Assuming that the population has always grown exponentially, what was the population of Tumbleweed 100 years ago ?