Math 258 – Third Hour Exam – Spring, 2004 v1

Name _____

Show your work. Partial credit will be given where appropriate. 16 points per problem
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1. Find the first derivative of

a) $y = \dfrac{e^{-2x^2} + 2x + 1}{10}$

b) $y = [\ln(e^{2x} + 1)]^2$

c) $y = \dfrac{e^x (x^2 + 3)}{\sqrt[3]{x+1}}$

2. Determine all functions $y = f(x)$ such that $y' = .7y$ and $f(0) = 3$

3. A local car dealer will sell you a $20,000 car. The dealer will take $20,000 in cash right now or will accept a payment of $23,040 four years from now. If you have the $20,000 cash, is it better for you to pay cash for the car or put the money in a bank account at an annual rate of 4% and pay $23,040 for the car four years from now? Assume continuous compounding in the bank account.

4. A construction crew working near the Columbia River unearthed the skeleton of an early resident of the area. The skeleton was wrapped in a woven-bark shroud. Tests of the bark showed that it contained 32% of the Carbon-14 found in living bark. Approximately how old was the shroud? (Recall that the decay constant for Carbon-14 is .00012).

5.A rocket is designed so that it's speed t minutes after launch is approximately e^{2t} miles per hour. The rocket must go 25,000 miles per hour to escape the gravitational pull of the earth (this is called the *escape velocity*). How many minutes after launch will the rocket achieve escape velocity?

6. Find the equation of the tangent line to $f(x) = \frac{x}{(\ln x + x)}$ at x = 1.

Extra Credit (4 points):

My favorite part of Calculus is:

_____a) Cool numbers like ***e.***

_____b) Cool rules like the Chain Rule (aka the Fun Rule).

_____c) Cool problems like problem number 3.

_____d) Being able to tell my friends that I know the first derivative of the natural logarithm function.