MATH FOR BUSINESS: CALCULUS, SPRING 2017 - MIDTERM II

Name: _____

You will receive no credit for submitting solutions that I cannot read and understand—be sure to write legibly! LEGIBLY!

Instructions: Answer all of the questions below, and one bonus question.

Problem 1. Find y' and y'' of the following functions:

(1) $y = e^{-0.5x}$
(2) $y = xe^{-x}$

Problem 2. Find the derivatives of each of the following functions:

(1) $f(x) = \sqrt{9 - x^2}$
(2) $y = \sqrt{e^x}$

Problem 3. Find $\frac{dy}{dx}$ by implicit differentiation.

(1) $x^2 + y^2 = 1$
(2) $e^{x^2 y} = x + y$

Problem 4. Differentiate the given functions.

(1) $f(x) = 3x - 2\ln(x)$
(2) $f(x) = \ln(\sqrt[5]{x})$

Problem 5. Each side of a square is increasing at a rate of $6\frac{cm}{s}$. At what rate is the area of the square increasing when the area is 16cm?

Problem 6. Assume that x and y are functions of t. If $y = x^3 + 2x$ and $\frac{dx}{dt} = 5$, find $\frac{dy}{dt}$ when $x = 2$.

Problem 7. (**Bonus**)
Differentiate the following function:

$$g(x) = e^{\frac{1}{f(x) + \frac{1}{f(x)}}}$$

where $f(x) = \frac{x^2}{e^x}$.

Problem 8. (**Bonus.**)
Show by implicit differentiation that the tangent to the ellipse

$$\frac{x^2}{a^b} + \frac{y^2}{b^2} = 1$$

at the point (x_0, y_0) is

$$\frac{x_0 x}{a^2} + \frac{y_0 y}{b^2} = 1$$

Note that in both the equations above a and b here are two different constants.

Date: April 25th, 2017.