MATH FOR BUSINESS: CALCULUS, SPRING 2017 - PROBLEM SET 5

Name: _____

Use this worksheet as the cover sheet for your write-up: write your name on this page, and staple this sheet to the front of your homework packet.

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

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

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

Problem 2. Differentiate

(1) $g(x) = \frac{e^x}{x^2}$
(2) $y = \frac{e^x}{1+x}$
(3) $h(v) = \frac{1+av^2}{1+bv}$

Problem 3. Find the slope of the curve at the given x-value. Give a decimal answer rounded to three decimal places.

(1) $\frac{x}{x^2-1}$ at the point $x = 2$.
(2) $y = e^x(0.8x^2 - x)$ at the point $x = 1.5$.

Problem 4. Answer each of the following parts.

(1) if g is differentiable, the reciprocal rule states that:

$$\frac{d}{dx}\left[\frac{1}{g(x)}\right] = -\frac{g(x)}{[g(x)]^2}$$

Use the quotient rule to prove this result.
(2) Use the reciprocal rule to differentiate.
(3) Use the reciprocal rule to verify that the power rule is valid for negative integers as well, that is

$$\frac{d}{dx}\left(x^{-n}\right) = -nx^{-n-1}$$

for all positive integers n.

Problem 5. Find the derivatives of each of the following functions:

(1) $f(x) = \sqrt{9 - x^2}$
(2) $y = \sqrt{e^x}$
(3) $y = xe^{-x^2}$
(4) $y = \sqrt{x + \sqrt{x}}$
(5) $g(t) = \frac{1}{(t^4+1)^2}$
(6) $h(x) = \sqrt[3]{x + e^x}$
(7) $g(x) = \frac{e^{-x}+1}{e^x+1}$

Problem 6. Answer the following.

(1) write $|x| = \sqrt{x^2}$ and use the chain rule to show that

$$\frac{d}{dx}\left(|x|\right) = \frac{x}{|x|}$$

(2) If $f(x) = |x^2 - 4|$, find $f'(x)$ and sketch the graph of f and f'. Where is f not differentiable?

Date: Tuesday March 7th, 2017.

Problem 7. Bonus Differentiate the following function:

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

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