

MATH FOR BUSINESS: CALCULUS, SPRING 2017 - PROBLEM SET 4

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 the derivatives of the functions below:

$$\begin{aligned}(1) \quad & x^9 \\(2) \quad & w(r) = r^{50} \\(3) \quad & h(v) = v^{-3}\end{aligned}$$

$$\begin{aligned}(4) \quad & R(t) = 56t^{-\frac{3}{5}} \\(5) \quad & R(x) = \frac{\sqrt{10}}{x^7}\end{aligned}$$

$$\begin{aligned}(6) \quad & f(t) = \frac{1}{2}t^6 - 3t^4 + t \\(7) \quad & 5e^x + 3 \\(8) \quad & F(x) = (\frac{1}{2}x)^5\end{aligned}$$

Problem 2. Find the first and second derivatives of the following functions functions:

$$\begin{aligned}(1) \quad & f(x) = x^4 - 3x^3 + 16x \\(2) \quad & g(r) = \sqrt{r} + \sqrt[3]{r}\end{aligned}$$

Problem 3. For what values of x does the graph of

$$f(x) = x^3 - 3x^2 + 12x$$

have horizontal tangent?

Problem 4. Suppose that the cost in dollars, for a company to produce x pairs of a new line of jeans is given by

$$C(x) = 200 + 3x + 0.01x^2 + 0.0002x^3$$

- (1) Find the marginal cost.
- (2) Find $C'(100)$ and explain its meaning.
- (3) Compare $C'(100)$ with the actual cost of manufacturing the 101'st pair of jeans.

Problem 5. Differentiate the following:

$$\begin{aligned}(1) \quad & f(x) = x^2 e^x \\(2) \quad & g(x) = \sqrt{x} e^x \\(3) \quad & R(t) = (t + e^t)(3 - \sqrt{t})\end{aligned}$$

Problem 6. If $f(x)$ is a differentiable function, find an expression for the derivative for the following:

$$\begin{aligned}(1) \quad & y = x^2 f(x) \\(2) \quad & y = e^x f(x)\end{aligned}$$

Problem 7. If $f(x)$ and $g(x)$ are two different differentiable functions, we know that $\frac{d}{dx}[f(x)g(x)]$ is given by the product rule. Use your knowledge of the product rule to find an expression for

$$\frac{d^2}{dx^2}[f(x)g(x)]$$

Problem 8. Bonus.

Let $f(x)$, $g(x)$, and $h(x)$ be three different differentiable functions. Find an expression for

$$\frac{d}{dx}[f(x)g(x)h(x)]$$