

## MATH FOR BUSINESS: CALCULUS, SPRING 2017 - PROBLEM SET 8

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.** A particle moves along the curve  $y = \sqrt{1+x^3}$ . As it reaches the point  $(2,3)$ , the  $y$ -coordinate is increasing at a rate of  $4\text{cm/s}$ . How fast is the  $x$ -coordinate of the particle changing at that instant?

**Problem 2.** The length of a rectangle is increasing at a rate of  $8\text{cm/s}$  and its width is increasing at a rate of  $3\text{cm/s}$ . When the length is  $20\text{cm}$  and the width is  $10\text{cm}$ , how fast is the area of the rectangle increasing?

**Problem 3.** Find the critical points of the following functions:

- (1)  $f(x) = 5x^2 + 4x$
- (2)  $f(x) = x \ln(x)$
- (3)  $f(x) = x^3 + x^2 - x$
- (4)  $f(x) = xe^{2x}$

**Problem 4.** Find the absolute minimum and maximum values of the function over the given intervals:

- (1)  $f(x) = 3x^2 - 12x + 5$ ,  $[0, 3]$
- (2)  $f(x) = x^4 = 2x^2 + 3$ ,  $[-2, 3]$
- (3)  $f(x) = (x^2 - 1)^3$ ,  $[-1, 2]$
- (4)  $f(x) = xe^{-\frac{x^2}{8}}$ ,  $[-1, 4]$

**Problem 5.** Use the first derivative test to find the local and minimum values of the functions.

- (1)  $y = 3x^2 - 11x + 4$
- (2)  $\frac{\ln(x)}{\sqrt{x}}$
- (3)  $f(t) = 3t - e^t + 5$

**Problem 6.** Find the intervals of concavity and inflections points of the functions:

- (1)  $x^4 - 4x^3 + 6x^2 - 1$
- (2)  $s^2 - s \ln(s)$