

MA131 Calculus for Life and Management Sciences A

Exam 2 Form 21

October 4, 2009

Instructions: Show all work relevant to the solution of each problem. i.e. no credit will be given for “just the answers.” Please do *all* work in the Blue Books! There are **six** problems which carry a total 100 points. You will have until the end of class to complete this exam. Good luck!

(10 pts) **Problem 1.** Find the first and second derivative of the function $f(x) = \sqrt{4x + 5}$.

(15 pts) **Problem 2.** Evaluate each of the following limits. If the limit does not evaluate to a finite real number, write “DNE.”

a. $\lim_{x \rightarrow 4} \frac{x^2 - 2x - 8}{x - 4}$

b. $\lim_{x \rightarrow 0} \sqrt{4x^2 + 2x + 1}$

c. $\lim_{x \rightarrow \infty} \frac{7x^2 - 121x + 266}{4x^2 + 9x - 3}$

(10 pts) **Problem 3.** Let $f(7) = 3$, $f'(7) = 2$, $g(7) = 5$, and $g'(7) = 6$.

a. Find $h(7)$ and $h'(7)$ where $h(x) = f(x) + 3g(x)$.

b. Find $h(7)$ and $h'(7)$ where $h(x) = \frac{1}{g(x)}$.

(25 pts) **Problem 4.** Let $f(x) = \frac{1}{3}x^3 - 4x$

a. Locate the relative extrema on $f(x)$.

b. Classify the relative extrema as relative maxima, minima, or neither.

c. Identify the interval(s) for which $f(x)$ is increasing.

d. Locate the inflection point(s) on $f(x)$.

e. Identify the interval(s) for which $f(x)$ is concave down.

(10 pts) **Problem 5.** The revenue earned by producing and selling x units of the board game *Watsonopoly* can be modelled by the revenue function

$$R(x) = 2000 - .1x - 1000(.2x + 7)^{-1}$$

a. Compute a function $R'(x)$ which gives the *marginal revenue* as a function of x .

b. Suppose I am producing 400 units. Should I expect revenues to increase or decrease by increasing production? Justify your answer.

(30 pts) **Problem 6.** Consider the graph of $f(x)$ below.

- At which labelled points does $\lim_{x \rightarrow (\text{labelled point})} f(x)$ exist?
- At which point(s) is $f(x)$ continuous?
- Is $f(x)$ continuous on the interval $(2, 4)$? Why or why not?
- At which point(s) is $f(x)$ differentiable?
- At label A is $f'(x)$ positive, negative, or zero?
- At which point(s) is there a relative extrema?
- At which point(s) is there a relative maxima?
- At label B is $f''(x)$ positive, negative, or zero?
- At label C is $f''(x)$ positive, negative, or zero?
- State the value of $f'(x)$ at label D.

