<u>Math 157 - Test 3a</u> November 19, 2014

Name _____

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (14 points) Let $f(x) = 2x^3 - 3x^2 - 36x + 10$. Find open intervals on which f is increasing/decreasing. Then find and classify all local (relative) extreme values.

2. (8 points) In solving an optimization problem, Joe found that x = 1 is a critical number of the function $P(x) = 2x + \frac{2}{x}$. Use calculus to show that Joe's critical number minimizes P.

3. (6 points) The graph of f is shown below. For each part of this problem, find a labeled point that satisfies the given condition.



4. (6 points) When the production level is 5000 units, marginal revenue is \$5.15 per unit and marginal cost is \$5.75 per unit. Do you expect maximum profit to occur at a production level above or below 5000 units? Explain your reasoning.

5. (8 points) Find the inflection point(s) of the graph of $g(x) = xe^{-x}$.

6. (8 points) Find the global (absolute) extreme values of $f(x) = 2x^3 - 9x^2 + 12x$ on the interval $-0.5 \le x \le 3$.

7. (6 points) Suppose f has a continuous derivative whose values are given in the table below.

x	-5	-4	-3	-2	-1	0	1	2	3	4	5
f'(x)	6	2	1	-1	-4	-5	-2	1	3	2	-1

(a) Find reasonable estimates for the critical numbers of f.

(b) Determine whether each one of your critical numbers gives a local (relative) minimum or maximum. Briefly explain how you know.

8. (8 points) The revenue from selling q items is $R(q) = 800q - q^2$, and the total cost is C(q) = 150 + 12q. Find the quantity that maximizes profit.

9. (8 points) The velocity, v, of an object at time t is described in the table below.

$t \; (sec)$	0	1	2	3	4	5	6
$v \; ({\rm ft/sec})$	3	6	10	16	22	20	18

(a) Use a right sum with $\Delta t = 2$ to estimate the total distance traveled by the object.

(b) Use a left sum with $\Delta t = 1$ to estimate the total distance traveled by the object.

(c) Which of your approximations do you think better estimates the distance traveled? Why?

10. (8 points) Use a left sum with 4 subintervals (rectangles) of equal width to estimate $\int_0^1 e^{-x^2} dx$.

11. (5 points extra credit) The quantity of a drug in the bloodstream t hours after a tablet is swallowed is given, in milligrams, by

$$Q(t) = 25(e^{-t} - e^{-2t}).$$

What is the maximum quantity of the drug in the bloodstream?

12. (5 points extra credit) Sketch the graph of f(x) = x + 2 over the interval from x = 0 to x = 3. Then use area to compute the exact value of $\int_0^3 (x+2) dx$. Show all work or explain your reasoning.

Math 157 - Test 3b November 19, 2014

Name_____

Score _____

Show all work to receive full credit. Supply explanations where necessary. YOU MUST WORK INDIVIDUALLY ON THIS EXAM.

1. (10 points) A landscape architect plans to enclose a 4000 square-foot rectangular region in a botanical garden. She will use shrubs costing \$30 per foot along three sides and flowers costing \$10 per foot along the fourth side. Determine a function giving the total cost of the project and then find the minimum cost. 2. (7 points) Use a left or right sum with 8 subintervals (rectangles) of equal width to estimate $\int_0^2 \frac{1}{1+t^2} dt$. Then use your calculator to estimate the value of the definite integral.

3. (3 points) The graph of f is shown below. Find a reasonable estimate for $\int_0^7 f(x) dx$.

