Math 157 - Test 3a

November 23, 2016

Name _____

Score _____

Show all work. Supply explanations where necessary.

1. (8 points) Let $g(x) = x^3 - 6x + 1$. Find the critical points of g. Then use the 2nd derivative to determine whether there is a relative (local) maximum or minimum at each critical point.

2. (6 points) Consider the function $f(x) = x^3 + 3x^2 - 9x - 10$ restricted to the domain $[-2, 2]$. Find the absolute (global) extreme values.

3. (12 points) Let $f(x) = 3x^4 - 8x^3 - 18x^2 + 6$.

(a) Find open intervals on which f is increasing/decreasing.

(b) Identify all relative (local) extreme values.

(c) Find open intervals on which the graph of f is concave up/down.

(d) Find all points of inflection.

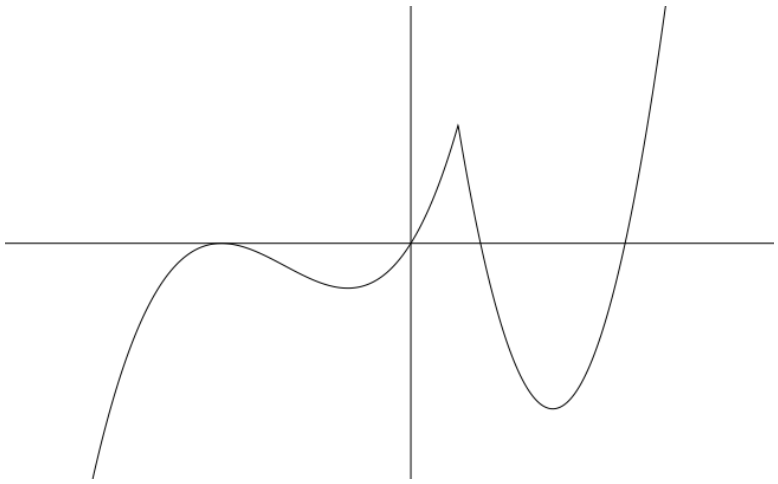
4. (6 points) Suppose f has a continuous derivative whose values are given in the table below.

x	-2	-1	0	1	2	3	4	5	6	7	8
$f'(x)$	8	2	1	-2	-7	-5	-1	1	4	2	-1

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

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

5. (5 points) Identify any critical points and points of inflection on the graph below. (Say which are which!)



6. (6 points) Find the points of inflection of the graph of $f(x) = x^4 + x^3 - 3x^2 + 2$.

7. (8 points) The quantity of a drug in the bloodstream t hours after a tablet is swallowed is given by

$$q(t) = 40(e^{-t} - e^{-2t}),$$

where $q(t)$ is in milligrams. Find the maximum amount of drug in the blood. Explain how you know you found an absolute (global) maximum.

8. (6 points) When the production level is 4000 units, marginal revenue is \$8.76 per unit and marginal cost is \$7.12 per unit. Do you expect maximum profit to occur at a production level above or below 4000 units? Explain your reasoning.

9. (10 points) An candy company finds that at a price of \$5.00, demand is 2000 units. For every \$0.25 decrease in price, demand increases by 400 units. Find the price and quantity sold that maximizes revenue.

10. (2 points) If a company's profit is increasing, what can you say about the company's marginal profit?

11. (5 points) Let $h(x) = x^4 - 8x^3 + 24x^2 - 32x + 16$. Show that $h''(2) = 0$. Is there an inflection point at $x = 2$?

12. (12 points) The velocity, v, of an object is sampled at various times, t, in seconds, throughout its motion.

t (sec)	0	1	2	3	4	5	6
v (ft/sec)	5	9	12	13	22	20	15

(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?

(d) Use rectangles to illustrate the right sum in part (a).

Math 157 - Test 3b

November 23, 2016

Name _____

Score _____

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

1. (8 points) A landscape architect plans to enclose a 4000 square-foot rectangular region in a botanical garden. She will use shrubs costing $40 per foot along three sides and flowers costing $20 per foot along the fourth side. Determine a function giving the total cost of the project and then find the minimum cost.

2. (6 points) A motorcyle accelerates smoothly over 6 seconds. The graph of the motorcycle's velocity function is shown below. Estimate the total distance traveled by the motorcycle. (Time is measured in seconds and velocity in feet per second.)