

Math 148
Exam 1
July 8, 2010

Name: _____

1. Your exam contains 7 questions and 5 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 1 hour for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. Put a box around your final answer where applicable.
5. Leave answers in exact form (as simplified as possible) or round to 4 decimal places.
6. You are allowed one 3" × 5" notecard for handwritten notes (both sides).
7. You may use a calculator for this exam, but I will not give credit for work done solely on a calculator (aside from arithmetic).
8. If you need extra space, use the back of the exam and clearly indicate this.

Problem	Total Points	Score
1	13	
2	8	
3	19	
4	9	
5	24	
6	17	
7	10	
Total	100	

1. (13 pts.) A company produces and sells mechanical monkeys. The following table gives some cost information for the company.

Quantity (monkeys)	480	500	520
Cost (dollars)	9700	9940	10,200

- (a) (8 pts.) Estimate the marginal cost at 500 items. (Show your calculations clearly.)
- (b) (5 pts.) If the company can receive \$15 in revenue from the sale of the 501st mechanical monkey, should it produce and sell the monkey? Explain briefly.

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2. (8 pts.) Suppose the temperature outside in degrees Fahrenheit is given by the function $T = f(t)$ where t is **minutes past noon**.

Given that $f(112) = 65$ and $f'(112) = 0.25$, estimate the temperature at 2 PM that day using a linear approximation.

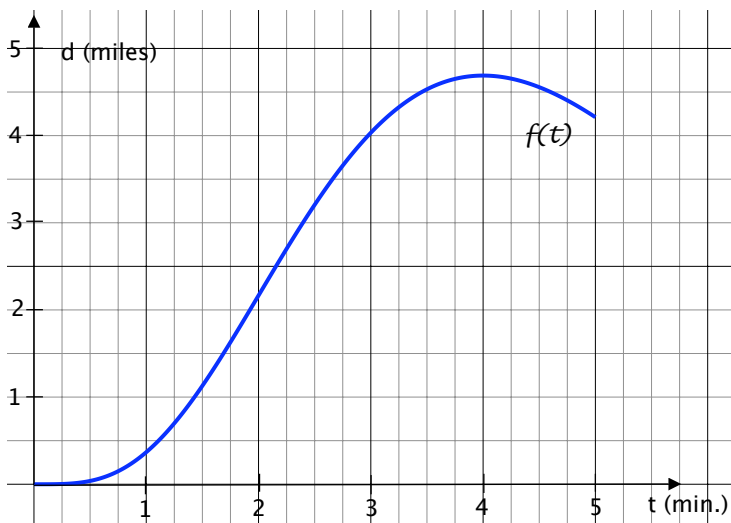
3. (19 pts.) Consider $g(x) = x^4 - 8x^3 + 3x + 5$ for parts (a) and (b) below.

(a) (11 pts.) Find the x -values for which $g(x)$ has a slope of 3.

(b) (8 pts.) Is $g(x)$ concave up or concave down at $x = -1$?

4. (9 pts.) $\frac{d}{dx}[-\ln(x) + \frac{1}{2}e^x + \ln(5)] = ?$

5. (24 pts.) At the end of the day, you drive south from Shoreline and record your distance (in miles) away from the school. The **distance** is given by the function $d = f(t)$ where t is in minutes. The graph of $f(t)$ is given below.

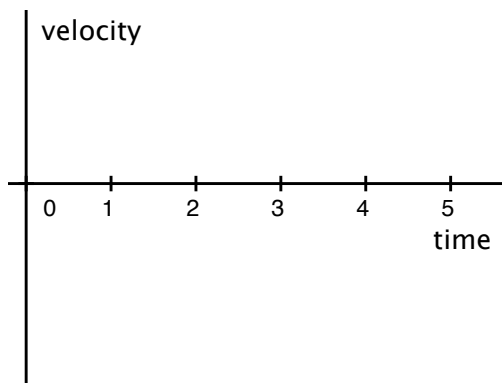


- (a) (8 pts.) What is the average velocity between 0 and 3 minutes? (Include units.)

- (b) (4 pts.) Approximately when is your instantaneous **velocity** the greatest?

- (c) (4 pts.) Estimate the intervals for which your **acceleration** is positive.

- (d) (8 pts.) Sketch a rough graph of the **velocity** function for $0 \leq t \leq 5$ on the axis below. You do not need to put a scale on the vertical axis.

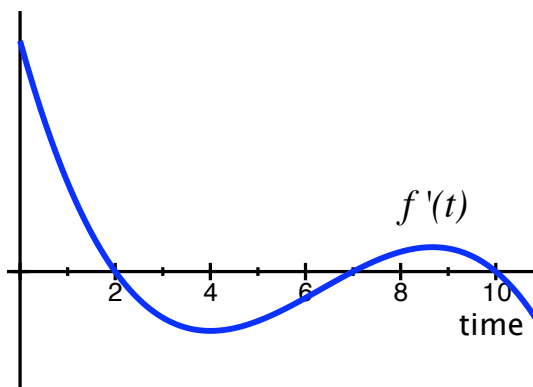


6. (17 pts.) Consider $h(x) = 2\sqrt{x} + \frac{4}{x^2}$ for parts (a) and (b) below.

(a) (10 pts.) Using differentiation, determine whether $h(x)$ is increasing or decreasing at $x = 1$.

(b) (7 pts.) Find an equation of the line tangent to $h(x)$ at $x = 1$.

7. (10 pts.) Suppose the number of cars, C , on the Highway 520 Bridge at time t hours is given by the function $C = f(t)$. The graph of the **derivative** $f'(t)$ is shown below.



(a) (4 pts.) What are the units of $f'(t)$?

(b) (6 pts.) For $0 \leq t \leq 10$, during which time intervals will the **number** of cars on the bridge be increasing?