Math 148
Final Exam
August 12, 2010

Name: _____

1. Your exam contains 6 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 and 15 minutes 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 4" $\times$ 6" notecard for handwritten notes (both sides) or your two 3" $\times$ 5" notecards from exam 1 and 2.
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	22	
2	13	
3	15	
4	23	
5	12	
6	15	
Total	100	

1. (22 pts.) Evaluate the following:

(a) (8 pts.) $\frac{d}{dx}\left[\frac{e^{3x}+7^x}{x^4}\right]$ (You do not need to simplify your answer to part (a).)

(b) (7 pts.) $\int \frac{x}{x^2+3}\,dx$

(c) (7 pts.) $\int_{-2}^{3}(4x^2-5)\,dx$

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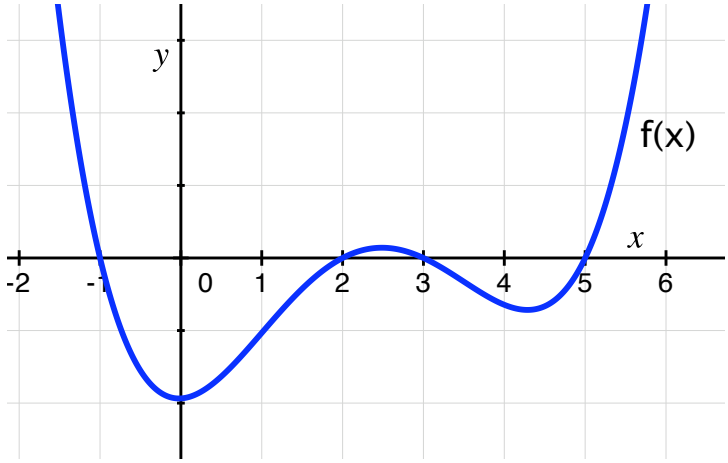
2. (13 pts.) Let $f(x) = x^3 \cdot \ln(2x)$. Find an equation of the tangent line to $f(x)$ at the point where $x = \frac{1}{2}$.

3. (15 pts.) Below is a graph of the function $f(x)$. Use it in parts (a) and (b) below.

(a) Give approximate intervals for which each of the following is true.



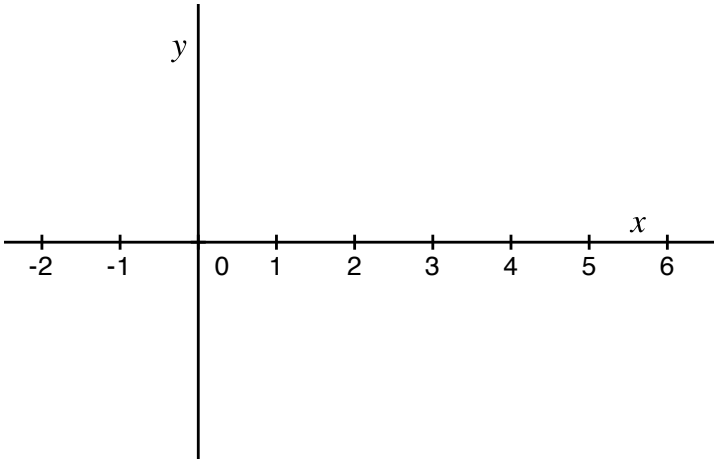
i. (2 pts.) $f(x)$ is positive

ii. (2 pts.) $f'(x) > 0$

iii. (2 pts.) $f''(x) > 0$

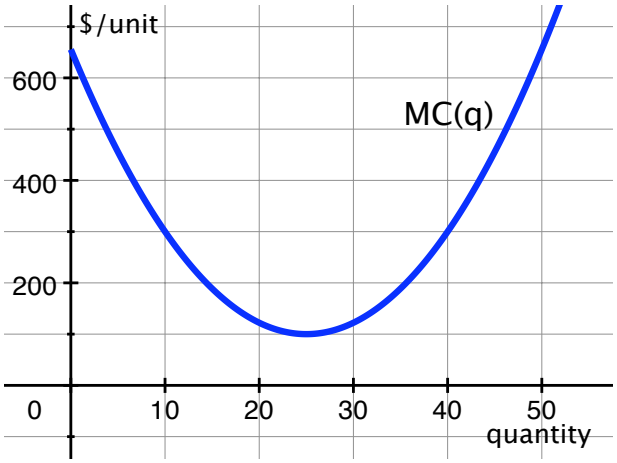
iv. (2 pts.) The slope of f is increasing

(b) (7 pts.) Sketch a rough graph of $f'(x)$. (You do not need to put a scale on the vertical axis.)



4. (23 pts.) The following is the graph of the marginal cost $MC(q)$ of producing and selling ukuleles. Use it in parts (a)-(d) below.

(a) (6 pts.) Estimate $\int_{10}^{30} MC(q)\,dq$.



(b) (5 pts.) Interpret the value of the definite integral from part (a) in terms of costs of producing ukuleles.

(c) (7 pts.) The fixed cost for producing ukuleles is only \$500. If you sell each ukulele for \$300, do you make a profit if you sell 30 ukuleles? If so, approximately how much profit? (Show your work.)

(d) (5 pts.) If you sell each ukulele for \$300, at what quantity do you have maximum profit?

5. (12 pts.) Find the total area of the region (or regions) between the curve $y = x^3 - 1$ and the x-axis from $x = 0$ to $x = 3$. (Hint: Sketch a rough graph.)

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6. (15 pts.) The rabbit population P in a certain area depends on the number of wolves w and the number of wolf hunters h. It can be modeled by the function $P = f(h, w) = 9\ln(h + 1) - 8\sqrt{w} + 30$.

   (a) (7 pts.) Find $f(12, 4)$. Interpret your answer in terms of the number of rabbits, wolves, and wolf hunters.

   (b) (8 pts.) Find $f_w(12, 4)$. Interpret your answer in terms of the number of rabbits, wolves, and wolf hunters.