MATH 112 B
Final Exam - Version 1
March 21, 2002

Name _____

Student ID #_____

Section _____

1	18	
2	13	
3	10	
4	17	
5	15	
6	27	
Total	100	

- You are allowed to use a calculator, a ruler, and one sheet of handwritten notes.
- You must show your work on all problems. The correct answer with no supporting work may result in no credit.
- If you use a trial and error method when an algebraic method is available, you will not receive full credit.
- Write your answers in the specified locations.
- If you need more room, use the backs of the pages and indicate to the reader that you have done so. If you still need more paper, please ask for some.
- Raise your hand if you have a question.
- You have 1 hour and 50 minutes to complete the exam.

GOOD LUCK!

1. (18 points - 6 points each)

(a) Compute $f'(x)$ if $f(x) = \left(x^4 - 3e^x\right)\left(\frac{2}{x} + \ln x\right)$. (Do not simplify.)

(b) Compute $\dfrac{\partial f}{\partial x}$ if $f(x, y) = 3x^2 y^{\frac{1}{3}} - 4\sqrt{x}y^3 + \ln y$.

ANSWER: $\dfrac{\partial f}{\partial x} =$_____

(c) Solve for m and b:

$$10b - 13m = 910$$
$$3m + 11b = 264$$

Show all your work and round your answers to 2 digits after the decimal.

ANSWER: $m =$_____, $b =$_____

2. (13 points)

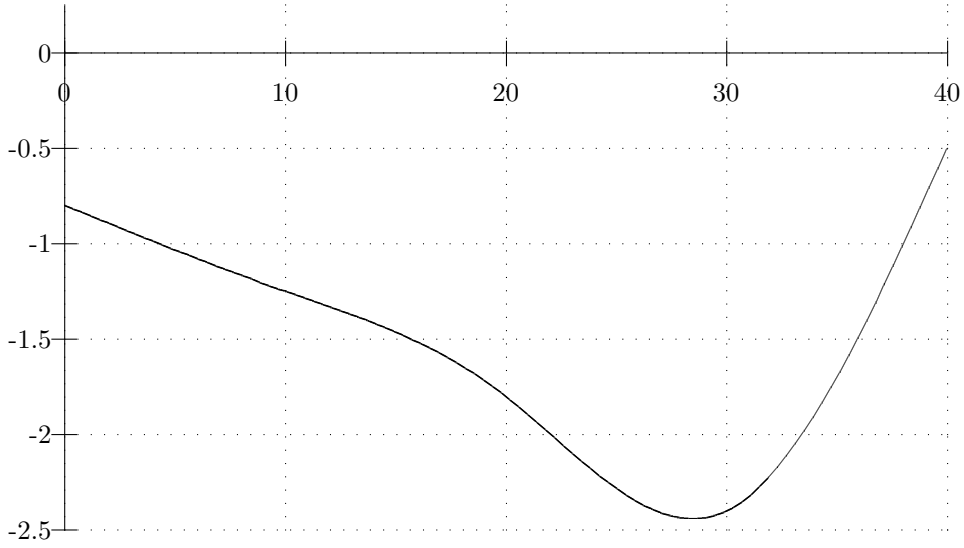
(a) (6 points) Compute $\int \frac{3}{\sqrt{x}} - 5x^7 + 2e^x \, dx$.

ANSWER: $\int \frac{3}{\sqrt{x}} - 5x^7 + 2e^x \, dx =$_____

(b) (7 points) Compute $\int_1^5 10x - \frac{3}{5}x^2 \, dx$.

ANSWER: $\int_1^5 10x - \frac{3}{5}x^2 \, dx =$_____

3. (10 points) The graph of $f(x)$ is given below.



One of the following is a reasonable estimate for the value of $\int_0^{40} f(x)\,dx$:

$$-65,\ -30,\ -13,\ 0,\ 60.$$

Determine which is the best estimate of the integral and explain why the others are clearly not good estimates.

ANSWER: The best estimate is _____.

EXPLAIN:

4. (17 points) The slope of the secant line for the function $y = P(t)$ is given by

$$\frac{P(t+r) - P(t)}{r} = 7^t + 2r - 3.$$

When necessary, round your answers to 2 digits after the decimal.

(a) (4 points) Find the value of $\dfrac{P(5.03) - P(5)}{0.03}$.

ANSWER: $\dfrac{P(5.03) - P(5)}{0.03}$=_____

(b) (4 points) Determine the value of $P(7) - P(2)$.

ANSWER: $P(7) - P(2) =$ _____

(c) (4 points) If $P(0) = 20$, find $P(2)$.

ANSWER: $P(2) =$_____

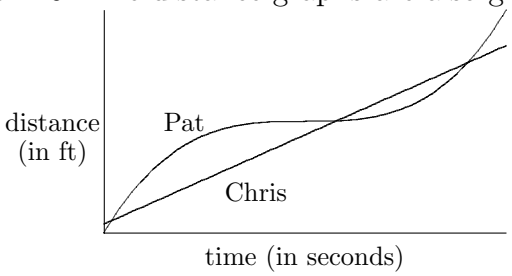
(d) (5 points) Determine the value of $P'(1.2)$.

ANSWER: $P'(1.2) =$_____

5. (15 points) Pat and Chris drive along a long straight road. At time $t = 0$, Pat is passing a tree and Chris is 10 feet ahead of Pat. The formulas below give each car's distance from the tree at time $t = 0$. The distance graphs are also given.

Pat: $P(t) = t^3 - 15t^2 + 75t$

Chris: $C(t) = 20t + 10$



(a) (5 points) Find the first time at which Pat's speed is 15 feet per second. (Round to 2 digits after the decimal.)

ANSWER: $t =$_____

(b) (5 points) Find a time after $t = 0$ at which Pat's overall average speed is the same as Pat's instantaneous speed.

ANSWER: $t =$_____

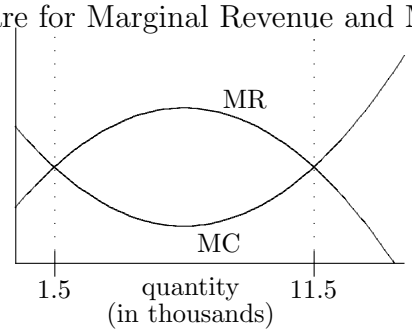
(c) (5 points) Find the longest time interval on which Chris drives faster than Pat.

ANSWER: from $t =$_____ to $t =$_____

6. (27 points) The functions and graphs below are for Marginal Revenue and Marginal Cost for a product.

MR: $r(q) = -q^2 + 13q + 23.5$

MC: $c(q) = q^2 - 13q + 58$



Let Total Revenue be given by the function $R(q)$ and Total Cost be given by the function $C(q)$, where $R(q)$ and $C(q)$ are in thousands of dollars and q is in thousands of items. As usual, assume $R(0) = 0$. Suppose fixed costs are 6000, so that $C(0) = 6$.

(a) (6 points) Determine whether each of the following is true or false.

i. T F Profit is maximized at $q = 1.5$.

ii. T F As quantity increases from 1500 items to 11,500 items, the change in TR is greater than the change in TC.

iii. T F $C(m) = \int_0^m c(q)\ dq$.

(b) (6 points) Compute the Variable Cost for 6000 items.

ANSWER: _____ dollars

(c) (6 points) Recall that average revenue is given by $\dfrac{R(q)}{q}$. What is the average revenue at $q = 3$?

ANSWER: _____dollars per item

(d) (6 points) Compute the total cost for 4000 items.

ANSWER: _____ dollars

(e) (3 points) Set up the equation that you would solve in order to determine when profit is 0. (Do not attempt to solve the equation.)