

MATH 112 B
Final Exam - Version 1
June 10, 2002

Name _____

Student ID # _____

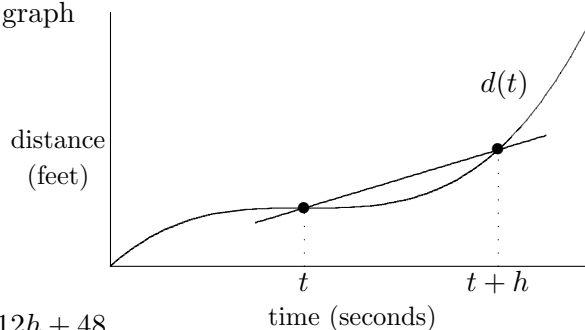
Section _____

1	15	
2	17	
3	12	
4	5	
5	18	
6	18	
7	15	
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. (15 points) The graph to the right is the graph of the distance of a bicycle from its starting point after t seconds. We do not know the formula for the distance, but we do know that the slope of the secant line pictured is given by



$$\frac{d(t+h) - d(t)}{h} = 3t^2 + 3th + h^2 - 24t - 12h + 48.$$

- (a) (5 points) Find the bicycle's average speed over the interval from $t = 2$ to $t = 7$.

ANSWER: _____ feet per second

- (b) (5 points) Find the instantaneous speed of the bicycle at $t = 5$.

ANSWER: _____ feet per second

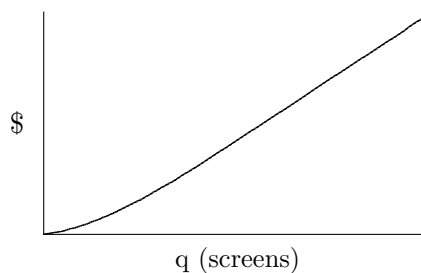
- (c) (5 points) How far is the bicycle from its starting point after 10 seconds?

ANSWER: _____ feet

2. (17 points) The graph to the right is of **Total Revenue** for selling nostril screens (you know, to keep out the bugs).

The formula for Total Revenue is:

$$T(q) = \frac{1}{6}q^4 - \frac{35}{6}q^3 + 75q^2 + 92q.$$



- (a) (4 points) Write out the formula for $M(q)$, the Marginal Revenue.

ANSWER: $M(q) =$ _____

- (b) (5 points) Find all values of q at which **Marginal Revenue** has a horizontal tangent.

ANSWER: $q =$ _____

- (c) (4 points) Determine the global maximum value and global minimum value of **Marginal Revenue** on the interval from $q = 0$ to $q = 15$.

ANSWER: global maximum value = \$ _____
 global minimum value = \$ _____

- (d) (4 points) Determine whether the graph of **Total Revenue** is concave up or concave down at $q = 9$ and justify your answer.

ANSWER: The graph of Total Revenue is (circle one) concave up concave down
 at $q = 9$ because: _____

3. (12 points) The Sunshine Juice Company makes two kinds of orange-tangerine juice blends. The Ultra Blend contains 80% orange juice and 20% tangerine juice. The Blend Super Pro contains 55% orange and 45% tangerine. Sunshine makes \$1.82 profit on each gallon of the Ultra Blend and \$1.02 profit on the Blend Super Pro. The supply of orange juice is limited to 4400 gallons per day and the supply of tangerine juice is limited to 2700 gallons per day. Let x be the amount of Ultra Blend produced in a day (in gallons) and let y be the amount of Blend Super Pro produced in a day (in gallons).

- (a) (4 points) Give the formula for daily profit in dollars: $P(x, y)$.

ANSWER: $P(x, y) =$ _____

- (b) (4 points) Give a formula $O(x, y)$ for the amount of orange juice needed and a formula $T(x, y)$ for the amount of tangerine juice needed to make x gallons of Ultra Blend and y gallons of Blend Super Pro.

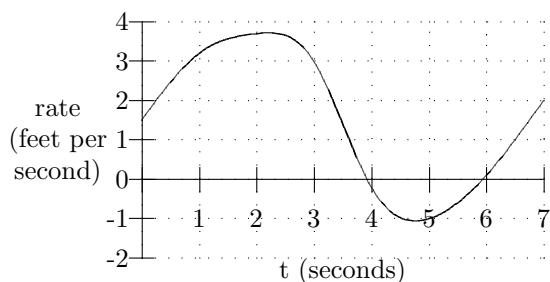
ANSWER: $O(x, y) =$ _____

$T(x, y) =$ _____

- (c) (4 points) If Sunshine produces 1800 gallons of Ultra Blend and 5200 gallons of Blend Super Pro, then how much of the 4400-gallon supply of orange juice will be left over?

ANSWER: _____ gallons left over

4. (5 points) Below is the graph of the rate of ascent of a hot air balloon on the time interval from $t = 0$ to $t = 7$. Explain whether or not the balloon ever drops below its starting height during this time.



5. (18 points)

(a) (4 points) Compute $\frac{dz}{du}$: $z = (u^2 + 3u + 4)^7$.

ANSWER: $\frac{dz}{du} =$ _____

(b) (4 points) Compute $\frac{\partial z}{\partial y}$: $z = x^3y^2 + 3x^2y + 4x^2e^y - 5 \ln y$.

ANSWER: $\frac{\partial z}{\partial y} =$ _____

(c) (5 points) Compute $\int 2 - \frac{5}{\sqrt{x}} + \frac{4}{x} dx$.

ANSWER: $\int 2 - \frac{5}{\sqrt{x}} + \frac{4}{x} dx =$ _____

(d) (5 points) Use the Fundamental Theorem of Calculus to compute:

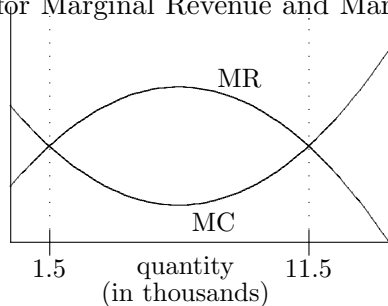
$$\int_0^{12} \frac{1}{3}z^3 - 4z^2 + 12z dz.$$

ANSWER: $\int_0^{12} \frac{1}{3}z^3 - 4z^2 + 12z dz =$ _____

6. (18 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) (5 points) Compute the Total Revenue for 6000 items.

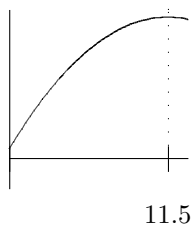
ANSWER: _____ dollars

- (b) (7 points) Recall that Average Total Cost is given by $\frac{C(q)}{q}$. What is the Average Total Cost at $q = 3$?

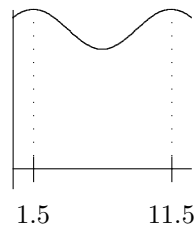
ANSWER: _____ dollars

- (c) (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.)

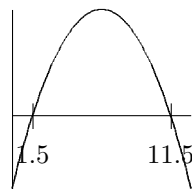
- (d) (3 points) Which of the following *could be* the graph of the Profit function? (Circle your choice.)



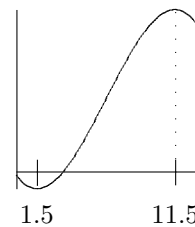
(i)



(ii)



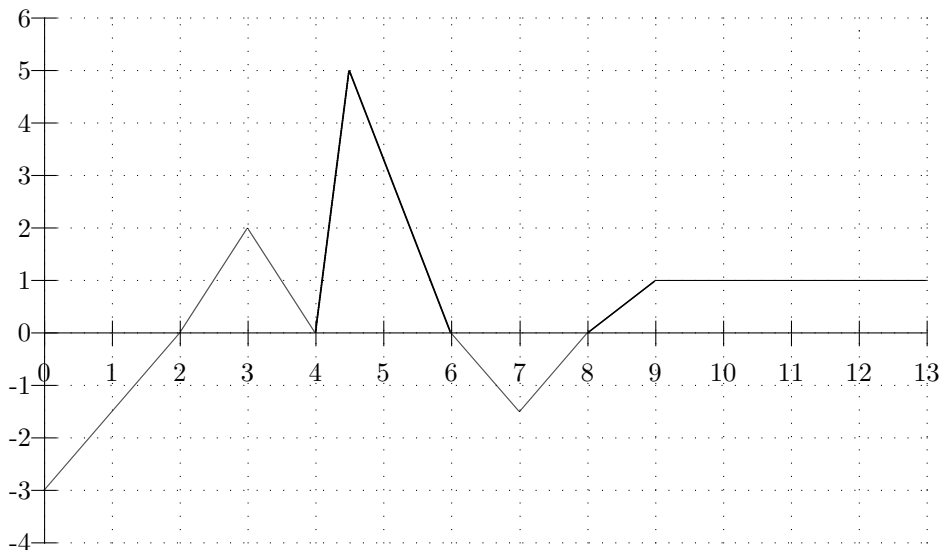
(iii)



(iv)

7. (15 points) The graph below is of the function $y = f(x)$. Using it, we define another function

$$A(m) = \int_0^m f(x) dx.$$



- (a) (4 points) List all values of m on the interval from $m = 0$ to $m = 13$ at which $A(m)$ has a horizontal tangent.

ANSWER: $m =$ _____

- (b) (3 points) List all values of m on the interval from $m = 0$ to $m = 13$ at which $A(m)$ has a local maximum.

ANSWER: $m =$ _____

- (c) (2 points) How are the graphs of $A(m)$ and $f(x)$ related? (Circle one.)

- i. $A(m)$ and $f(x)$ have the same graph.
- ii. The graph of $f(x)$ and the derived graph of $A(m)$ are the same.
- iii. The graph of $A(m)$ and the derived graph of $f(x)$ are the same.
- iv. None of the above.

- (d) (2 points) As m increases from 7 to 10, $A(m)$: (circle one)

increases all the time	increases then decreases	decreases all the time	decreases then increases	remains constant	none of these
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- (e) (4 points) Compute $A'(3) + A(3)$.

ANSWER: _____