Math 111B - Winter 2003
Final Exam
March 19, 2003

Name: _____ Section: _____

1	20	
2	12	
3	20	
4	15	
5	15	
6	15	
Total	97	

- Complete all questions.
- Where needed, use the following definitions:

$$MC(q) = TC(q+1) - TC(q)$$

$$MR(q) = TR(q+1) - TR(q)$$

- You may use a calculator during this examination. Other electronic devices are not allowed.
- All answers must either be exact (such as $\sqrt{2}$, $\frac{5}{3}$, or 125), or a decimal approximation containing at least 4 digits (e.g., if the exact answer is $\sqrt{2}$, then 1.414 would be acceptable, but 1.4 would not be). If in doubt, use more digits.
- You may use one hand-written 8.5 by 11 inch page of notes. Both sides of the page can be used.
- Show all work for full credit.
- You have 110 minutes to complete the exam.

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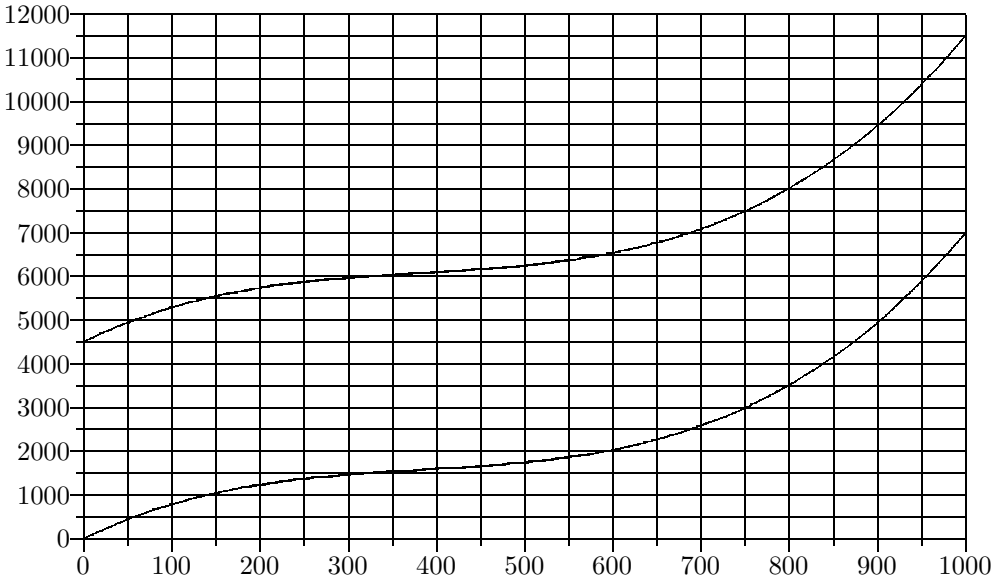
1. Suppose you are manufacturing and selling electronic cat detectors. The graph below shows total cost (TC) in dollars and variable cost (VC) in dollars for a range of production quantities q.



(a) (5 points) Find the Breakeven Point.

(b) (5 points) Estimate the marginal cost (MC) for $q = 250$.

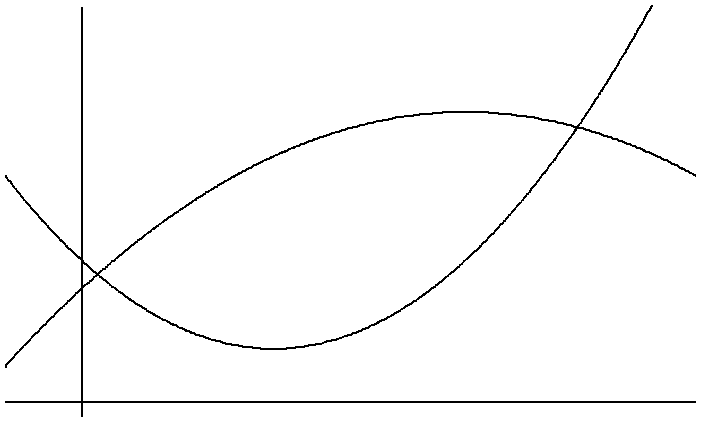
(c) (5 points) What is the fixed cost (FC)?

(d) (5 points) How many detectors are sold when the marginal cost is equal to the average variable cost?

2. The graphs below are parabolas with the following formulas:

$$f(x) = x^2 - 5x + 10$$

$$g(x) = -\frac{1}{2}x^2 + 5x + 8$$



(a) (2 points) Label the graphs, clearly indicating which is $y = f(x)$ and which is $y = g(x)$.

(b) (5 points) Find the values of x at which the two graphs cross.

(c) (5 points) Find the largest interval over which $f(x)$ and $g(x)$ are both increasing.

3. You sell toothbrush cases. For an order of q cases, the total revenue, TR, and total cost, TC, are:

$$TR = -0.04q^2 + 4.2q \qquad\qquad TC = 85 + 0.2q$$

(a) What quantity, q, yields the maximum profit?

(b) What is the maximum profit?

(c) On a certain order, the profit was \$6. What is the largest number of cases this order could have?

(d) For what value of q is MR equal to twice MC? (A non-whole number is okay).

4. For each of the following sequences, do the following:

   i. Determine whether the sequence is additive, multiplicative, or neither. If the sequence is additive or multiplicative, then give
   ii. a recursive formula for the sequence, and
   iii. an explicit formula for the sequence.

   (a) -3,10,23,36,49, ...

   (b) 3072, 1536, 768, 384, 192, ...

   (c) 1, 3, 5, 8, 10, 12, 14, ...

5. (a) Find the APY of a continuously compounded account paying 5.8% interest

(b) How long does it take for \$1500 to grow to \$8000 in an account paying 2.13% interest compounded quarterly?

(c) If you leave \$14000 in a continously compounded account which pays 3.2% interest, how long will it take to earn \$3000 in interest?

6. (a) An account balance grows from \$500 to \$8400 over 20 years, with interest compounded monthly. How much interest was paid in the first month?

(b) How much money do you have to deposit in an account paying 3.66% interest compounded continously in order to have \$9700 after 26 months?

(c) How long does it take for the balance to triple in an account that pays 4.35% interest, compounded monthly?