

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

Name: _____

Section: _____

1	15	
2	20	
3	17	
4	15	
5	15	
6	15	
Total	95	

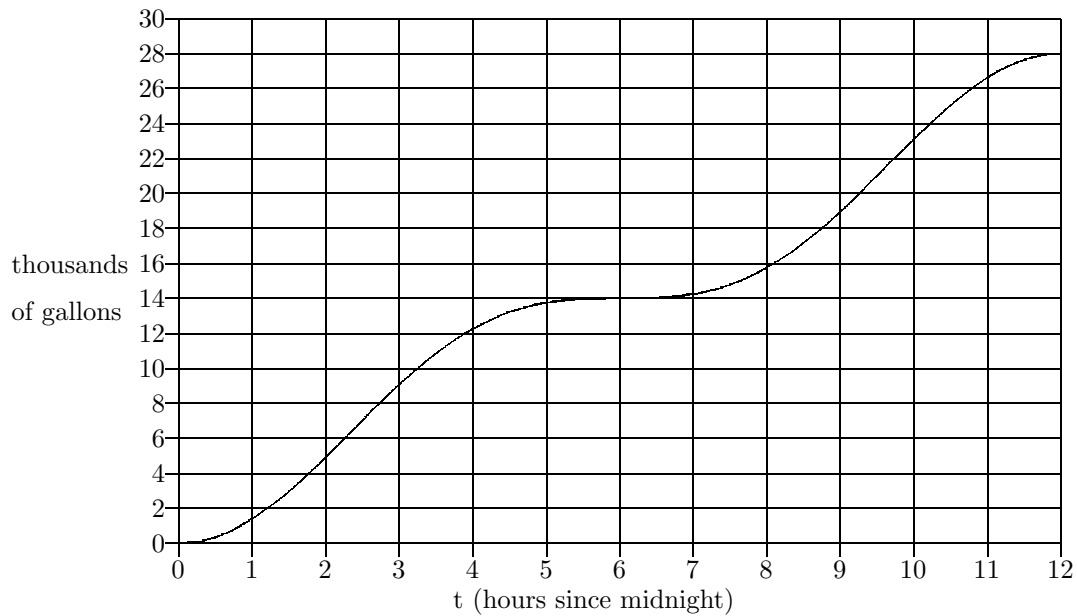
- Complete all questions.
- Where needed, use the following definitions:

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

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

- 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.

1. The graph below is of the amount of water, $I(t)$, that has flowed into a reservoir by various times over a 12-hour interval starting at midnight.



- (a) What is the average rate of inflow between $t = 3$ and $t = 10$?
- (b) Water flows out at a rate of 2500 gallons per hour. What is the smallest amount of water we can have in the reservoir at midnight to ensure that we won't run out during this 12 hour interval?
- (c) At what time is the overall rate of inflow ($I(t)/t$) greatest?

2. You are in the business of manufacturing and selling electric fountain pens. To encourage large orders, you give quantity discounts. For an order of 10 pens, you charge \$24 per pen. For an order of 40 pens, you charge \$18 per pen. Assume that the price per pen, p , is a linear function of the order size, q .

(a) Give an explicit formula for the price per pen for an order of q pens.

(b) What is the total revenue for an order of q pens?

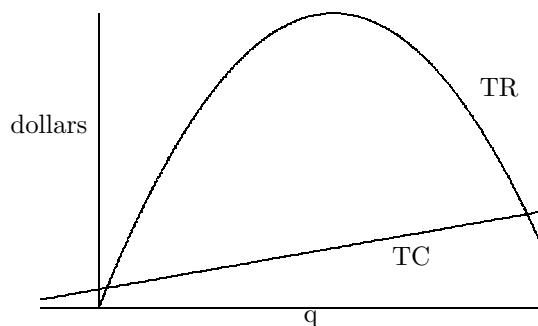
(c) Suppose you make a profit of \$200 on an order of 30 pens. If you have zero fixed costs, what is your cost per pen?

(d) What size order will maximize revenue?

3. Suppose you are manufacturing and selling unicycle wheels. Your total cost and total revenue functions are

$$TR = -1.25(q - 80)^2 + 8000$$

$$TC = 500 + 14q$$



- (a) (5 points) What is the marginal revenue (MR) at 35 wheels?
- (b) (4 points) What is average total cost (AC) to produce 40 wheels?
- (c) (3 points) What are the fixed costs (FC)?
- (d) (5 points) What is the smallest value of q at which the total revenue is at least \$800 ?

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) 1, 3, 9, 27, 81,...

(b) 2.1, 4.2, 8.4, 17.8, 36.6, ...

(c) -2, 5, 12, 19, 26, ...

5. (a) How much money do you need to deposit in an account paying 6% annual interest compounded continuously in order to be able to withdraw 45\$ in interest every month?

(b) How long does it take the balance to double in an account that pays 3.3% annual interest, compounded monthly?

(c) What is the APY on an account paying 7.11% annual interest, compounded daily (assume 365 days per year)?

6. (a) Suppose you put \$5040 into an account paying 2.24% annual interest compounded monthly. How long does it take for you to earn \$800 in interest?
- (b) An account has an APY of 6.52%. If the account pays interest compounded quarterly, what is its annual interest rate?
- (c) An account balance grows from \$750 to \$6000 over 25 years. If the account paid interest compounded monthly, what was the annual interest rate?