

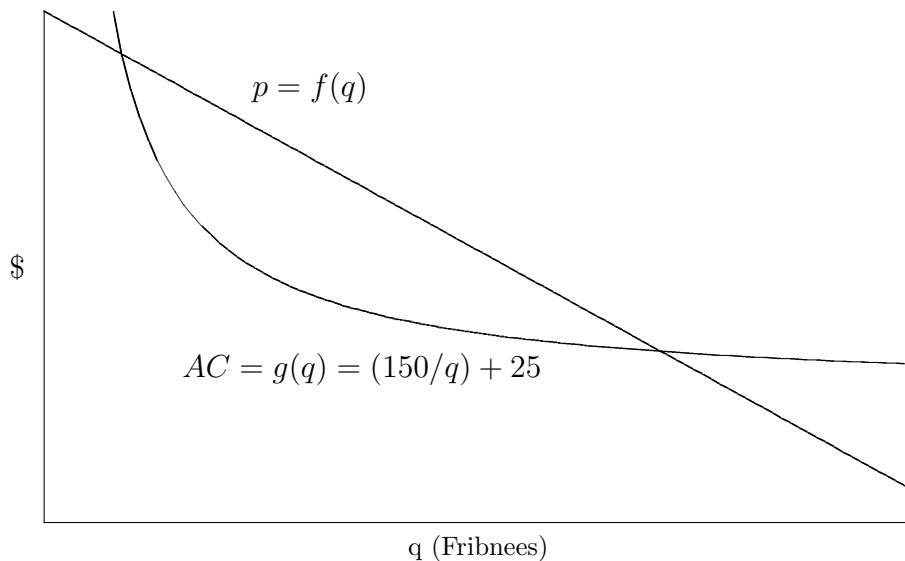
MATH 111A - Autumn 2001  
EXAM II - Version 1

Name \_\_\_\_\_

Section \_\_\_\_\_

Show all your work on these pages. Write your answers on the answer sheet provided.

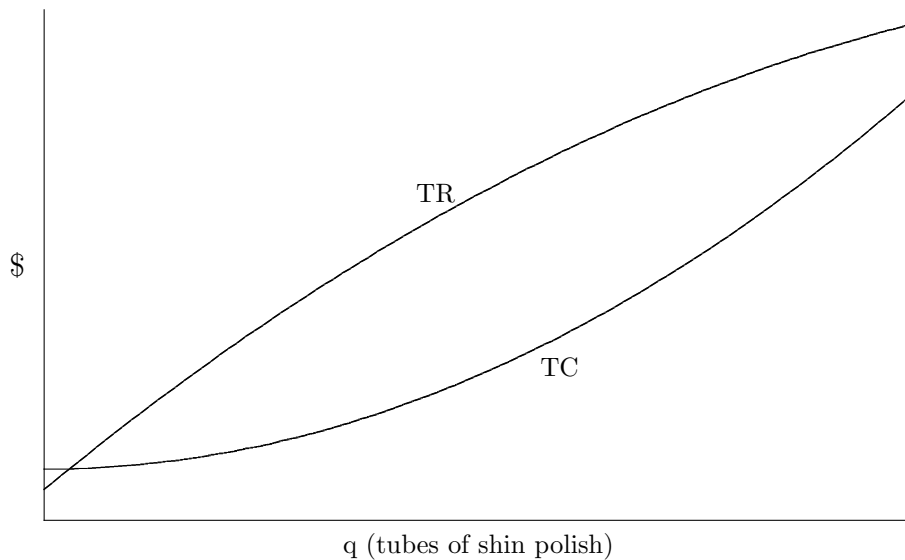
1. (20 points) The graph below shows a function  $f(q)$ , where  $p = f(q)$  is the price per Fribnee for a purchase of  $q$  Fribnees. The graph also shows a function  $g(q)$ , where  $AC = g(q)$  is the average cost per Fribnee when  $q$  Fribnees are produced.



- (a) When 10 Fribnees are sold, the price is \$62.50 per Fribnee. When 15 Fribnees are sold, the price is \$43.75 per Fribnee. Find the linear formula for price  $p$ .
- (b) What is the total cost to produce 3 Fribnees?
- (c) What is the value of fixed cost?
- (d) What is the formula for profit at  $q$  Fribnees?
- (e) Find the quantity  $q$  at which profit is the greatest.

2. (15 points) Water begins flowing into an empty tank at time  $t = 0$ . After  $t$  hours, the rate at which water flows in is given by the formula  $r(t) = 25 - 3t$ , where the rate is measured in gallons per hour.
- (a) When is water flowing in at a rate of 12 gallons per hour?
  - (b) If the tank is empty at time  $t = 0$  and the rate of change of the amount of water is  $r(t) = a - bt$ , then the amount of water in the tank at time  $t$  is given by the formula  $W(t) = at - \left(\frac{b}{2}\right)t^2$ . How many gallons are in the tank after 6 hours?
  - (c) Find a time **between 0 and 8 hours** when there are 16 gallons in the tank.
  - (d) What is the highest the water level in the tank will get?

3. (15 points) The graphs below are of total cost and total revenue for producing tubes of shin polish.



Their formulas are:

$$TR = R(q) = -2q^2 + 20q + 3$$

$$TC = C(q) = 3q^2 + 5$$

- (a) Recall that marginal revenue is given by:

$$R(q + 1) - R(q).$$

Use this formula to compute the marginal revenue at  $q$  tubes of shin polish. Simplify your answer to the form

$$( \quad )q + ( \quad ).$$

- (b) The formula for marginal cost is  $MC(q) = 6q + 3$ . Use this formula and your answer to part (a) to determine the quantity that will yield maximum profit. (Your answer should be a whole number of tubes.)
- (c) What is the maximum possible profit?
- (d) What is the average total cost ( $AC$ ) to produce 10 tubes of shin polish?
- (e) For what value of  $q$  is the average variable cost ( $AVC$ ) \$21 per Fribnee?