

## Group Assignments #14 Univariate Calculus (Part B)

1. Define the following

a. Marginal Propensity to Consume

b. Marginal Utility

c. Marginal Product

2. Perform the operation as indicated

1) Given  $C = 1200 + 0.8Yd$ , where  $Yd = Y - T$  and  $T = 100$ , find the  $mpc$  ( $mpc = dC / dY$ )

2) Given  $TP = Q^3 - 6Q^2 + 5Q + 11$ , find the average and marginal product

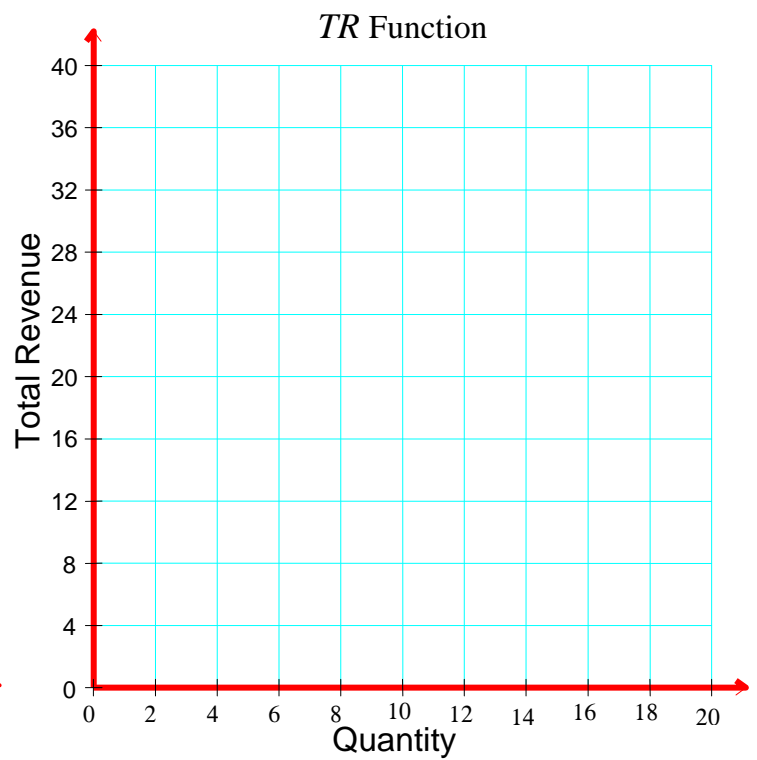
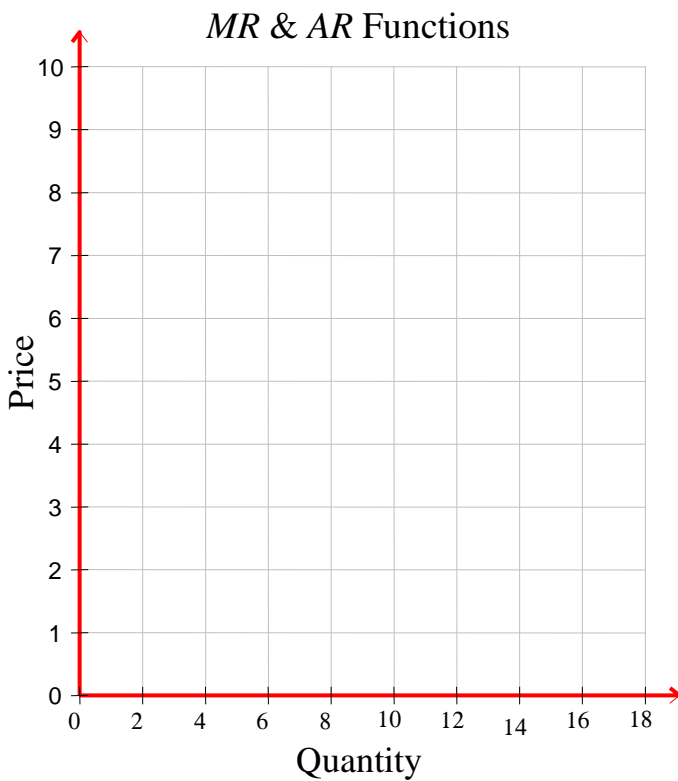
$AP =$

$MP =$

3. You own an apparel-producing company whose total revenue function is

$$TR = 8Q - 0.5Q^2.$$

- Find the derivative of this function ( $dTR/dQ$ ), which represents marginal revenue.
- Find the average revenue function,  $TR(Q)/Q$ . (note: The  $AR$  function is the demand curve).
- Graph  $MR$ ,  $AR$  &  $TR$  over the range  $0 \leq Q \leq 16$ .



- Which is greater, the slope of the marginal revenue curve or the average revenue curve?
- What is the relevance of  $Q = 8$  for the three functions. Would you ever produce at  $Q > 8$ .

4. The assumption of profit maximization, where profit is equal to the difference between revenue and cost, is frequently used in microeconomics. To maximize profit, or achieve the greatest difference between revenue and cost, the firm selects that output at which marginal revenue equals marginal cost.
- a. Given the demand function

$$P = 70 - 10Q$$

determine total revenue and determine the associated marginal revenue function

$$TR =$$

$$\frac{dTR}{dQ} = MR =$$

- b. Given the total cost function

$$TC(Q) = 175 - 50Q + 20Q^2.$$

derive the marginal cost function from the total cost function

$$\frac{TC(Q)}{dQ} = TC'(Q) = MC(Q) =$$

- c. At what quantity of output is profit maximized?

5. The linear demand function for a product is given by:

$$Q = 50 - 5P$$

Where  $Q$  is quantity demand and  $P$  is price of the product

- a. Calculate the slope of the demand curve (i.e. the marginal demand)
- b. Substituting this value into the price elasticity of demand formula we obtain

$$\epsilon =$$

- c. From this formula derive the price elasticity of demand at  $P = 10$ ,  $P = 5$  and  $P = 0$ .

At  $P = 10$ :

At  $P = 5$ :

At  $P = 0$ :

- d. At what price range is demand elastic, inelastic?

From  $P = 0$  to  $P = 5$ , inelastic. From  $P = 5$  to  $P = 10$ , elastic

6. A firm's short-run production function is given by:

$$Q = 2500L - (0.5)L^2$$

where  $Q$  = total output and  $L$  = number of workers

- a. Find the expression for the marginal production of labor ( $MP_L$ )

$$MP_L = \frac{dQ}{dL} = 2500 - L$$

- b. Find the value of  $MP_L$  when

$$L = 100 \quad L = 1000 \quad L = 2000 \quad L = 2500 \quad L = 3000$$

- c. Does the law of diminishing marginal productivity apply to this particular function?
- d. What is the maximum number of workers the firm will hire in the short run? Explain?
- e. Is the conclusion reached in part (d) applicable in the long run? Explain