**Exercise Set 10**
**ELASTICITY**

III. Questions

1. Sketch the given demand curve. The horizontal intercept is _____, the vertical intercept is _____ and the slope is _____.

Equation for the demand curve:

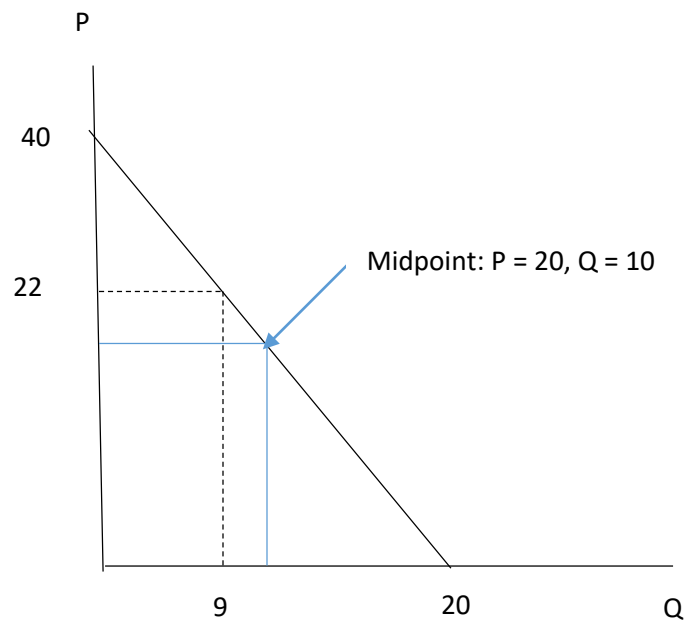    *P = 40 - 2Q*

To find horizontal intercept, set *P* = 0.

    2Q = 40

    Q = 20

Similarly, the vertical intercept is 40.

Slope   = -1(Vertical intercept)/Horizontal intercept

    = -2

P

40

22

Midpoint: P = 20, Q = 10

9         20      Q

2. Select a value for $P_1$, and compute the corresponding quantity demanded. Suppose $P_1$ **= 22**.

    From the demand equation:

    22 = 40 – 2Q

    Q = 9

    Denote this quantity by $Q_1$:  $Q_1$ = 9.

3. Indicate the point $(Q_1, P_1)$ on the graph. This combination of price and quantity yields the firm a revenue of $ _____.

    TR = Price x Quantity

    TR = (22)(9) = $198

4. Choose a different price. Suppose the new price is: $P_2$ **= 26**.

    The corresponding quantity demanded is 7, and the firm's total revenue is $182.

5. Consider a change in price from $P_1$ to $P_2$.

a.   In this region the elasticity of demand is _____. Show calculations.

Use the midpoint formula.

      % change in $Q$   = 100*(Change in Q)*(Average Q)

                = 100(9-7)/(8)

                = 25%

      % change in $P$   = 100*(Change in P)*(Average P)

                = 100(26-22)/(24)

                = 16.7%

     Elasticity:   $e$   = (% change in Q)/(% change in P)

                =  25/16.7

                =  1.5    [*Note:* Demand is elastic in this range of prices, since $e > 1$]

b.   The price change has caused the firm's revenue to [ *increase | decrease | remain unchanged* ].

     Total revenue has fallen from $198 to $182, a decline of $16.

6. On the graph, indicate the regions where: (a) $e > 1$, (b) $e < 1$, and (c) $e = 1$. In which of these regions will an increase in price lead to higher total revenue? Explain.

   The midpoint of the demand curve demarcates the elastic region from the inelastic region. In this problem, the midpoint occurs at $P = 20$.

- If price is above 20, $e > 1$
- If price is below 20, $e < 1$
- If price is at 20, $e = 1$

   Total revenue = $P \times Q$

      If $P$ goes up, $TR$ will also increase if:
      The decrease in $Q$ is smaller in percentage terms than the increase in $P$. This means that demand must be inelastic: $e < 1$.

7. If the current price is below the midpoint of the demand curve, and the firm wishes to increase total revenue, it should [ *increase | reduce* ] its price. Explain.

> Demand is inelastic below the midpoint ($e < 1$): $Q$ is not very responsive to a change in $P$. The firm can thus increase its revenue by *raising* the price.

8. If an increase in price leads to less total revenue, we may conclude that demand is [ *elastic | inelastic | unit-elastic* ]. Explain.

> Demand is elastic. When $e > 1$, and price rises, quantity demanded will fall by a larger percentage, leading to lower total revenue.

9. If the firm wishes to maximize total revenue, it should charge a price of $ _____. Explain.

> $20, the price at the midpoint of demand. If you raise the price, you will be in the elastic region ($e > 1$); if you lower the price, you will be in the inelastic region ($e < 1$). In either case, revenue will fall. So, maximum revenue is attained when the price is at the midpoint.

> At this price, the firm will sell 10 units of the good and earn a revenue of $200.