Q1 P1
Q2 P2

<table>
<thead>
<tr>
<th>Demand for X</th>
<th>Price of good Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
</tr>
</tbody>
</table>

Delta Q
Delta P
P Bar
Q Bar
Delta Q/Delta P
P Bar/Q Bar
(Delta Q/Delta P)*(P Bar/Q Bar)

Arc Cross-Price Elasticity

\[ E_{x,y} = 0.86 \text{ Inelastic} \]

\( X \) and \( Y \) are substitutes in consumption because of a positive elasticity, and by looking at the table, as the price of good \( Y \) falls, the demand for good \( X \) also falls.

\( (E_x, \text{ Price of Pepsi} \downarrow, \text{ DD for coke} \downarrow) \)

\[ E_{x,y} = \frac{\Delta Q_x}{\Delta P_y} \cdot \frac{P_y^{\text{new}}}{Q_x^{\text{old}}} \]
2. Consider the following equations for market demand and supply:
   \[ Q_s = -20 + 3P \]
   \[ Q_d = 220 - 5P \]

   (a) Calculate the consumer surplus for \( Q = 1 \) (5 Points)
   (b) Calculate the producer surplus for \( Q = 1 \) (5 Points)

\[ 3P - 20 = -5P + 220 + 5P + 6P \]
\[ 8P - 20 = 220 + 20 + 20 \]
\[ 8P = \frac{240}{8} = 30 \]
\[ P = 30 \text{ at Equilibrium} \]
\[ Q = 70 \text{ at Eq.} \]

\[ Q_d = 220 - 5P - 220 \]
\[ Q_d - 220 = -5P \]
\[ -\frac{P}{5} = \frac{Q_d - 220}{5} \]
\[ P = -\frac{(Q_d - 220)}{5} \]
\[ -(1 - 220) = 43.8 \]
\[ \frac{43.8}{5} = 8.76 \]

\[ \text{Consumer Surplus: Price the consumer is willing to pay} - \text{Price they actually pay.} \]
\[ 43.8 - 30 = 13.8 \]

\[ P = \frac{Q_s + 20}{3} \]
\[ P = \frac{(1 + 20)}{3} \]
\[ P = 7 \]

\[ 30 - 7 = 23 \]
3. The government is concerned about the price of milk being too high. They claim that at the prevailing equilibrium price only a few rich people can afford to buy milk. In order to ensure that the price of milk is low and that there is enough milk available at that low price would you recommend that they (A) Impose a price ceiling at an affordable price below the equilibrium price or (B) Give producers a per unit subsidy for every gallon that they produce. Explain your answer with a neatly labeled demand & supply graph of the milk market. (10 Points)

I would recommend that the government give milk producers a per unit subsidy rather than create a price ceiling.

- In this graph, a price ceiling (PC) shifts market equilibrium so that demand exceeds supply, although milk is cheaper, there is a shortage.

10

- This graph shows a subsidy. The subsidy lowers production cost moving P*, Q* SE to P$, Q$, whose price is lower and equilibrium quantity is higher.
4. Draw a two-panel graph that shows how the consumers demand curve for X is affected when the price of good Y increases but money income and the price of X stay the same. In the upper panel draw the budget constraint and indifference curves and show the consumers utility maximizing combinations of X & Y. In the lower panel draw the consumers demand curve for X. Show how the consumers demand curve for X is affected by this price change. Assume that X and Y are perfect complements. (10 Points)

\[ U_6 > U_5 > U_4 > U_3 > U_2 > U_1 > U_0 \]

If X & Y are perfect complements, a consumer will always need an equal amount of both (like left side of right side).

Demand for X decreases when the price of Y increases ceteris paravis.
5. Using demand & supply graphs illustrate two cases where the seller bears the entire burden of a per unit tax increase. (10 Points)

\[ E = 0 \text{, } DD \text{ has greater elasticity.} \]

Seller pays \( T = 0 \text{.} \)

The price paid by the buyer before the tax is \( P \).

The tax is \( T \), so the seller pays \( T \).

\( T = 0 \)
6. Is the supply curve S1 more elastic, less elastic or equally elastic at point A than supply curve S2 is at point B? Mathematically prove your answer.

\[ E_1 = \left| \frac{\Delta Q}{\Delta p} \times \frac{P_1}{Q_1} \right| \]

\[ E_0 = \left| \frac{\Delta Q}{\Delta p} \times \frac{P_0}{Q_0} \right| \]

Elastic lines: \( \Delta Q = S \Delta P \)

\[ \frac{P_1}{Q_1} \lesssim \frac{P_0}{Q_0} \]

\[ E_0 > E_1 \] (10)
7. Calculate the numerical value of the elasticity of supply at point X.

\[ E_s = \left| \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1} \right| \]

Linear SS, so \( P = a + bQ \)

\( a = 0 \), so \( P = bQ \)

\( P_1 = bQ_1 \rightarrow \frac{P_1}{Q_1} = b \)

\[ E_s = \left| \frac{1}{b} \times \frac{P_1}{Q_1} \right| = \left| \frac{1}{b} \times b \right| = 1 \]

10
8. (a) Define Producer Surplus. (5 Points)
    (b) Calculate producer surplus at the quantity $Q^*$ in the following graph.
    (5 Points)

Producer Surplus is equal to the market price equilibrium minus the height of the SS curve at some point Q. Which is equal to the profit margin for the seller:

Because $S$ is inelastic the producer surplus is 0.

$$PS = p^* - (p^* for any q) = 0$$
9. Name the three types of Capital and give one example of each type.
   (10 Points)

   Financial - stocks
   Physical - building
   Human - education
10. Starting from a position of equilibrium the expected future price of Pepsi rises. Explain with a graph of the Pepsi market what will happen to the equilibrium price and the equilibrium quantity of Pepsi. (10 Points)

$P^e \uparrow \Rightarrow D^t \uparrow \text{ today and } S^t \downarrow \text{ as sellers hoard quantities to sell later}$

$\therefore P^* \uparrow, Q^* \uparrow ^-$