• Name: _____

• Date: _____

BUSN 301: Intermediate Microeconomic Theory

Quiz #2: Suggested Solutions

Spring 2026

INSTRUCTIONS:

• Each quiz is graded on a 100-point basis and contributes to your Quiz component of the course grade.

• You are expected to show all relevant steps and reasoning.

• Answers must be clearly written and well-organized.

• Graphs, when required, must be clearly labeled, with axes, curves, and key points identified.

Problem 1. Elasticities   **(6 Points Each)**

Let m be the consumer's income, and p_1 be the unit price of good 1. Suppose that a consumer's demand for a good is given by:

$$x_1(p_1, p_2, m) = p_1^{-0.3} p_2^{0.4} m^{1.2}$$

1.A. Compute the income elasticity of demand for good 1.

$$\varepsilon_m = \frac{\partial x_1}{\partial m} \cdot \frac{m}{x_1} = 1.2 p_1^{-0.3} p_2^{0.4} m^{0.2} \frac{m}{p_1^{-0.3} p_2^{0.4} m^{1.2}} = 1.2$$

1.B. If income increases by 5%, by how much does quantity demanded change?

- Since the income elasticity of demand is 1.2, we know that the quantity demanded of good 1 increases by 1.2% for each 1% increase in the consumer's income. Therefore, the quantity demanded of good 1 will increase by 6% following a 5% increase in the consumer's income.[1]

1.C. Compute the own-price elasticity of demand for good 1.

$$\varepsilon = \frac{\partial x_1}{\partial p_1} \cdot \frac{p_1}{x_1} = -0.3 p_1^{-1.3} p_2^{0.4} m^{1.2} \frac{p_1}{p_1^{-0.3} p_2^{0.4} m^{1.2}} = -0.3$$

1.D. If price increases by 5%, what happens to the consumer's total expenditure on good 1? Briefly explain.

- Since the own-price elasticity of demand is -0.3, we know that the quantity demanded of good 1 decreases by 0.3% for each 1% increase in the unit price of good 1. Therefore, the consumer's quantity demanded falls by 1.5% following a 5% increase in the unit price.[2] Because the percentage increase in price exceeds the percentage decrease in quantity demanded, total expenditure on good 1 increases. In particular, total expenditure increases by approximately 3.5%.

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[1] $1.2 \times 5\% = 6\%$
[2] $-0.3 \times 5\% = -1.5\%$

Problem 2. Individual to Market Demand   **(6 Points Each)**

Suppose there are two consumers in a market for a single good. Individual demands are given by:

$$x_A(p) = 40 - p, \quad x_B(p) = 60 - \frac{2}{3}p$$

Assume that each consumer's demand cannot be negative, so that $x_i(p) \geq 0$, and that $p \geq 0$.

2.A. Compute the choke price (the price at which quantity demanded becomes zero) for each consumer.

- A: When $p = 40$, we find that $x_A = 40 - 40 = 0$.
- B: When $p = 90$, we find that $x_B = 60 - \frac{2}{3} \cdot 90 = 0$.

2.B. Derive the market demand function $X(p)$. Write your answer as a piecewise function.

$$X(p) = \begin{cases} 0, & \text{when } p \geq 90 \\ 60 - \frac{2}{3}p, & \text{when } 40 \leq p < 90 \\ 100 - \frac{5}{3}p, & \text{when } 0 \leq p < 40 \end{cases}$$

- When $p \geq 90$, neither consumer A nor B participates in the market, so $X(p) = 0$.
- When $40 \leq p < 90$, only consumer B participates in the market, so $X(p) = x_B(p)$.
- When $0 \leq p < 40$, both consumers participate in the market, so $X(p) = x_A(p) + x_B(p)$.

2.C. (`Extra Credit:2 Points`) Suppose that the market supply function is given by:

$$S(p) = \frac{1}{3}p$$

Find the equilibrium price and quantity in this market.

- Scenario #1: Both consumers participate in the market.
    - $X(p^*) = S(p^*) \quad \Rightarrow \quad 100 - \frac{5}{3}p^* = \frac{1}{3}p^* \quad \Rightarrow \quad 2p^* = 100 \quad \Rightarrow \quad p^* = 50$
    - This is a contradiction, since the price must be less than or equal to 40 for both consumers to participate in the market.

- Scenario #2: Only consumer B participates in the market.
    - $X(p^*) = S(p^*) \quad \Rightarrow \quad 60 - \frac{2}{3}p^* = \frac{1}{3}p^* \quad \Rightarrow \quad p^* = 60$
    - The market price lies between 40 and 90, which is consistent with the piecewise demand function.

- The equilibrium market price is $p^* = 60$, and the equilibrium quantity is $q^* = 20$.

Problem 3. Competitive Equilibrium and Welfare (6 Points Each)

Suppose market demand and supply in a competitive market are given by:

$$D(p) = 120 - 2p, \quad S(p) = 3p$$

3.A. Determine the equilibrium price p^* and quantity q^*.

$$D(p^*) = S(p^*) \quad \Rightarrow \quad 120 - 2p^* = 3p^* \quad \Rightarrow \quad 5p^* = 120 \quad \Rightarrow \quad \boxed{p^* = 24} \quad \Rightarrow \quad \boxed{q^* = 72}$$

3.B. Compute consumer surplus and producer surplus at the equilibrium.

- $CS = (60 - 24) \times 72 \times \frac{1}{2} = 1,296$
- $PS = 24 \times 72 \times \frac{1}{2} = 864$

Suppose that due to an increase in costs, the market supply is now: $S'(p) = 3p - 10$.

3.C. Determine the new equilibrium price p' and quantity q'.

$$D(p') = S(p') \quad \Rightarrow \quad 120 - 2p' = 3p' - 10 \quad \Rightarrow \quad 5p' = 130 \quad \Rightarrow \quad \boxed{p' = 26} \quad \Rightarrow \quad \boxed{q' = 68}$$

3.D. Compute consumer surplus and producer surplus at the new equilibrium.

- $CS = (60 - 26) \times 68 \times \frac{1}{2} = 1,156$
- $PS = \left(26 - \frac{10}{3}\right) \times 68 \times \frac{1}{2} = \frac{2,312}{3} \simeq 770.67$

3.E. Draw a single graph showing $D(p)$, $S(p)$, and $S'(p)$. Clearly label all intercepts and the equilibrium points, and shade the areas representing the new consumer surplus and producer surplus.
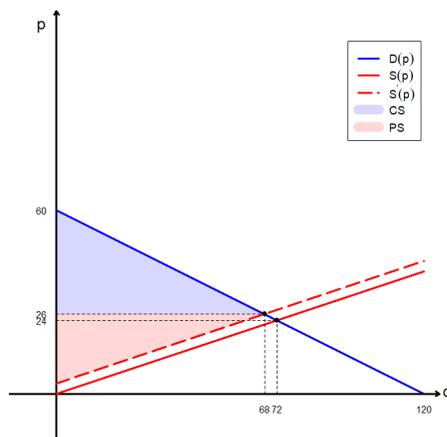
Problem 4. Taxation, Incidence, and Deadweight Loss   **(6 Points Each)**

Suppose market demand and supply in a competitive market are (identical to Problem 3):

$$D(p) = 120 - 2p, \quad S(p) = 3p$$

Now suppose that the government imposes a per-unit tax of $t = 5$.

4.A. At the original equilibrium (before the tax), compute the price elasticity of demand and the price elasticity of supply.

- $\varepsilon^D = \dfrac{\partial D}{\partial p}\dfrac{p}{D} = -2 \cdot \dfrac{24}{72} = -\dfrac{2}{3}$

- $\varepsilon^S = \dfrac{\partial S}{\partial p}\dfrac{p}{S} = 3 \cdot \dfrac{24}{72} = 1$

4.B. Find the price paid by consumers p_d, the price received by producers p_s, and the quantity traded in the post-tax market q_t.

$$D(p_d) = S(p_s) \implies 120 - 2p_d = 3p_s \implies 120 - 2(p_s + 5) = 3p_s \implies \boxed{p_s = 22}$$
$$\implies \boxed{p_d = 27}$$
$$\implies \boxed{q_t = 66}$$

4.C. Compute the per-unit tax burden on consumers and producers.

- Recall that the pre-tax market equilibrium price was $p^* = 24$.[3]
    - The price paid by consumers increased by $27 - 24 = 3$.
    - The price received by producers decreased by $24 - 22 = 2$.
- The consumers bear $3 of the tax per unit, while producers bear $2 per unit.

4.D. Compute total tax revenue and the deadweight loss of the tax.

- $t \times q_t = 5 \times 66$, so total tax revenue is $330.

- $5 \times (72 - 66) \times \dfrac{1}{2}$, so the deadweight loss is $15.

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[3]See problem 3.A.

Problem 4. Taxation, Incidence, and Deadweight Loss (continued)   **(6 Points Each)**

4.E. Based on your answers to 4.A, which side of the market should bear more of the tax burden? Does this match your answer in 4.B? Briefly explain.

- The less elastic side of the market is less responsive to price changes, so it bears a larger share of the tax burden.
- Since demand is less elastic than supply, consumers should bear more of the tax burden.
- This matches the answer in 4.B, where consumers bear $3 of the tax per unit, while producers bear $2 per unit.

Suppose that instead of the per-unit tax, the government grants a per-unit subsidy of $s = 5$

4.F. (Extra Credit:2 Points) Find the price paid by consumers p_d, the price received by producers p_s, and the quantity traded in the post-subsidy market q_s.

- The key is to set up the relationship between p_d and p_s. In a subsidized market, consumers pay less than what the producers receive, and the difference is the per unit subsidy. So, we set up $p_d = p_s - 5$.

$$D(p_d) = S(p_s) \implies 120 - 2p_d = 3p_s \implies 120 - 2(p_s - 5) = 3p_s \implies \boxed{p_s = 26}$$
$$\implies \boxed{p_d = 21}$$
$$\implies \boxed{q_s = 78}$$

4.G. (Extra Credit:2 Points) Compute total subsidy expenditure and the deadweight loss of the subsidy.

- $s \times q_s = 5 \times 78$, so total subsidy expenditure is $390.
- $5 \times (78 - 72) \times \dfrac{1}{2}$, so the deadweight loss is $15.

Problem 5. Feedback **(1 Point Each)**

5.A. Which chapter(s) that were covered in this quiz did you find challenging? (Select all that apply.)

- Chapter 6: Demand (e.g., elasticities, total revenue)
- Chapter 14: Consumer's Surplus (e.g., reservation price, willingness to pay)
- Chapter 15: Market Demand (e.g., horizontal summation, piecewise demand)
- Chapter 16: Equilibrium (e.g., competitive equilibrium, taxation)

Briefly explain why you found this part challenging (1–2 sentences).

5.B. At this point in the course, which statement best describes you?

- I understand the ideas conceptually but struggle with the math
- I can do the math but do not always understand what it means
- I am comfortable with both the math and the intuition
- I feel lost and am not sure where my confusion starts

Briefly say what would help most in class.

- Original Score: _____

- Original Date: _____

- Recovered Score: _____

- Recovered Date: _____