CONCORDIA COLLEGE
MOORHEAD, MINNESOTA

- Name: ____________________
- Date: ____________________

BUSN 301: Intermediate Microeconomic Theory

Problem Set #2

Spring 2026

INSTRUCTIONS:

- Each problem set is graded on a 100-point basis and contributes to your Problem Set 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 sets must be submitted by the posted deadline.

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Problem 1. Walrasian Demand

Suppose that a consumer's utility function is given as $u(x_1, x_2) = 2x_1^{\frac{1}{3}} x_2^{\frac{2}{3}}$. The unit prices of good 1 and good 2 are denoted by p_1 and p_2, respectively. The consumer has an income of m.

1.A. Compute the marginal utility with respect to good 1 and good 2.

1.B. Write down the consumer's utility maximization problem and derive the first-order (tangency) condition.

1.C. Write down the equation describing the consumer's budget line.

1.D. Derive the consumer's Walrasian demand function for good 1, $x_1(p_1, p_2, m)$.

Problem 1. Walrasian Demand (continued)

1.E. Calculate the price elasticity of demand for good 1.

1.F. Based on your answer to 2 . E, is good 1 an ordinary good or a Giffen good? Briefly explain.

1.G. If the price of good 1 increased by 5%, what happens to total revenue earned by sellers of good 1? Briefly explain.

1.H. Calculate the income elasticity of demand for good 1.

Problem 2. The Engel Curve

Suppose that a consumer's utility function is given as $u(x_1, x_2) = (0.4x_1^2 + 0.6x_2^2)^{\frac{1}{2}}$. This utility function is known as a Constant Elasticity of Substitution (CES) utility function. The unit prices of goods 1 and 2 are denoted by p_1 and p_2, respectively. The consumer has an income of m. The marginal rate of substitution between goods 1 and 2 is given as follows:

$$MRS = \frac{MU_1}{MU_2} = \frac{2x_1}{3x_2}$$

2.A. *OPTIONAL:* Compute the marginal utility with respect to good 1 and good 2.
Hint: Use the chain rule: $\frac{d}{dx}f(g(x)) = g'(x)f'(g(x))$.

2.B. Write down the consumer's utility maximization problem and derive the first-order (tangency) condition.

2.C. Write down the equation describing the consumer's budget line.

2.D. Derive the expression for the consumer's Engel curve for good 1, $x_1(m, p_1, p_2)$.

Problem 2. The Engel Curve (continued)

2.E. Compute the income elasticity of demand for good 1.

2.F. Based on your answer to 2.E, is good 1 a normal good or inferior good? Briefly explain.

2.G. Is the Engel curve linear, convex, or concave in income? Briefly explain.

2.H. Graph the Engel curve for good 1. Clearly label axes and indicate whether the good is normal or inferior.

Problem 3. Individual and Market Demand

Suppose there are three consumers in a market for a single good. Assume each consumer's demand cannot be negative (that is, $x_i(p) = 0$ whenever the expression above is negative). Each consumer has an individual demand function given by:

$$\begin{cases} x_A = 20 - 2p \\ x_B = 20 - p \\ x_C = 20 - \frac{1}{2}p \end{cases}$$

3.A. For each consumer, compute the choke price (the price at which quantity demanded becomes zero).

3.B. Derive the market demand function $X(p)$ by horizontally summing the individual demand functions. Your final answer should be written as a piecewise function.

3.C. Graph the market demand curve. Clearly label all intercepts and any kink points.

Problem 4. Equilibrium

Suppose the market demand (D) and supply (S) functions in a competitive market are given by:

$$\begin{cases} D(p) = 200 - 2p \\ S(p) = 3p \end{cases}$$

4.A. Determine the equilibrium price p^* and quantity traded in the market q^*.

4.B. Demand is now $D'(p) = 150 - 2p$. Determine the new equilibrium price and quantity.

4.C. In a single graph, plot the original demand (D), new demand (D'), and supply curve. Clearly label all intercepts and both market equilibria.

Problem 4. Equilibrium (continued)

4.D. Calculate the original consumer surplus and producer surplus under the original supply and demand curves.

4.E. Calculate the new consumer surplus and producer surplus under the new demand curve.

4.F. Calculate total surplus before and after the demand shift. By how much does total surplus change?

4.G. Compute the price elasticity of demand and price elasticity of supply at the original equilibrium. Which side of the market is more elastic?

Problem 5. Taxation

Suppose the market demand (D) and supply (S) functions in a competitive market are given by:

$$\begin{cases} D(p) = 200 - 2p \\ S(p) = 3p \end{cases}$$

5.A. Suppose that a per-unit tax of $t = 5$ is levied. Determine the price to consumers p_d, price to producers p_s, and the quantity traded q_t in this market.

5.B. In a single graph, plot the pre-tax and post-tax equilibria alongside the demand and supply curves. Clearly label p^*, q^*, p_d, p_s, and q_t.

5.C. Calculate total surplus in the pre-tax market.

5.D. Calculate total surplus in the post-tax market.

Problem 5. Taxation (continued)

5.E. Calculate the per-unit and total tax burden for consumers and producers.

5.F. Calculate the deadweight loss of taxation.

5.G. Suppose that instead of the per-unit tax of $t = 5$, an ad valorem tax of $\tau = 10\%$ is levied. Determine the price to consumers p_d, price to producers p_s, and the quantity traded q_τ in this market.

- Score: ______________________________
- Date: ______________________________