



• Name: _____

• Date: _____

BUSN 301: Intermediate Microeconomic Theory

Quiz #3

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. Technology**(5 Points Each)**

Suppose that a firm's production function is given by:

$$f(x_1, x_2) = x_1^{\frac{1}{2}} x_2^{\frac{1}{2}}$$

1.A. Compute the marginal product of each input.

1.B. Find the marginal rate of technical substitution ($MRTS_{1,2}$).

1.C. Does this production function exhibit diminishing marginal product in each input? Briefly explain.

1.D. Does this production function exhibit increasing, constant, or decreasing returns to scale? Show your work.

1.E (Extra Credit: 2 Points) If the firm's production function is $g(x_1, x_2) = x_1^{\frac{2}{3}} x_2^{\frac{2}{3}}$, does g exhibit increasing, constant, or decreasing returns to scale?

Problem 2. Cost Minimization**(5 Points Each)**

Consider the same production function:

$$f(x_1, x_2) = x_1^{\frac{1}{2}} x_2^{\frac{1}{2}}$$

Input prices are given by $w_1 = 4$ and $w_2 = 1$. The firm wishes to produce $\bar{y} = 4$ units of output.

2.A. Set up the firm's cost minimization problem.

2.B. Derive the condition that characterizes the optimal choice of inputs.

2.C. Solve for the optimal inputs x_1^* and x_2^* .

2.D. Compute the firm's minimum cost.

2.E. (Extra Credit: 2 Points) Suppose that w_1 increases. How does this affect the ratio $\frac{x_1^*}{x_2^*}$? Briefly explain.

Problem 3. Cost Curves**(5 Points Each)**

Suppose that a firm's total cost function is given by:

$$c(y) = y^2 + 6y + 9$$

- 3.A. Identify the fixed cost and variable cost.
- 3.B. Derive the marginal cost (MC), average variable cost (AVC), and average total cost (ATC).
- 3.C. Find the output level that minimizes ATC. At what output level does MC intersect ATC?
- 3.D. Graph the MC, AVC, and ATC curves. Clearly label:
- The minimum of ATC
 - The intersection of MC and ATC
 - The relative positions of AVC and ATC

Problem 4. Firm Supply**(5 Points Each)**

Suppose that a competitive firm's total cost function is:

$$c(y) = y^2 + 6y + 9$$

4.A. Find the first-order condition for the firm's profit maximization.

4.B. Find the firm's short-run supply function.

4.C. What is the shutdown price?

4.D. Suppose that the market price is $p = 10$. Find the firm's optimal output and profit.

Problem 5. Industry Supply**(5 Points Each)**

Suppose there are n identical firms in the market, each with the cost function from Problem 4. Market demand is given by:

$$D(p) = 62 - p$$

5.A. Derive the industry supply function.

5.B. Suppose that $n = 5$. Find the market equilibrium price and quantity.

5.C. At this equilibrium, do firms earn positive, zero, or negative profit? Briefly explain.

5.D. Describe what happens in the long run if firms are earning positive profit.

5.E. (Extra Credit: 2 Points) Find the long-run equilibrium price.

Problem 6. Feedback

(Extra Credit:1 Point Each)

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

- Chapter 19: Technology (e.g., marginal product, MRTS)
- Chapter 20: Profit Maximization (e.g., profit function, first-order condition)
- Chapter 21: Cost Minimization (e.g., short run vs. long run, input choice)
- Chapter 22: Cost Curves (e.g., MC, AVC, ATC)
- Chapter 23: Firm Supply (e.g., shutdown condition, profit)
- Chapter 24: Industry Supply (e.g., entry, long-run equilibrium)

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

6.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: _____

• Recovered Score: _____

• Original Date: _____

• Recovered Date: _____