

AAE635: Applied Microeconomic Theory

Discussion Section 3

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Today's goal

- Analyze the profit maximization problem of a competitive firm.
- Visualize and discuss how changes in input prices affect firm behavior.

Practice Questions

1. A profit-maximizing firm produces a single output y using two inputs $x = (x_1, x_2)$, where $x_1 > 0$ and $x_2 > 0$. The production function is $f(x_1, x_2) = 0.4 \ln x_1 + 0.6 \ln x_2$. The prices of y , x_1 and x_2 are denoted $p > 0$, $w_1 > 0$ and $w_2 > 0$, respectively.
 - (a) Write down the optimization problem for the firm.
 - (b) Solve the optimization problem and find the input demand function $x_1^*(p, w_1, w_2)$, $x_2^*(p, w_1, w_2)$, and the profit function $\pi^*(p, w_1, w_2)$.
 - (c) Is the profit function homogeneous? If so, what is the degree? Interpret this result.
 - (d) Is the input demand function homogeneous? If so, what is the degree? Interpret this result.
 - (e) Derive the partial derivatives of $x_1^*(p, w_1, w_2)$, $x_2^*(p, w_1, w_2)$ with respect to p , w_1 , and w_2 . Interpret the signs of these partial derivatives.

2. Activity: Visualizing Profit Maximization

- (a) Individually, sketch the firm's isoquants and isoprofit lines for the production function $f(x_1, x_2) = 0.4 \ln x_1 + 0.6 \ln x_2$ with arbitrary prices $p = 1$, $w_1 = 1$, $w_2 = 2$.
- (b) Identify the tangency point where the optimal input bundle lies.
- (c) Form groups of 4 and compare your sketch. Are your tangency conditions consistent?
- (d) Share one insight with the class: what changes in the graph if w_2 decreases?