Homework Policy:
Study You can study the homework on your own or with a group of fellow students. You should feel free to consult notes, text books and so forth.

The quiz will be available Wednesday at 5pm. Following the Honor code, you should find 20 minutes and do the quiz, by yourself and without using any notes. Paper and pen should be all you need. Then turn it in by Thursday 5pm. (drop off in box in front of Baxter 133). It will include one question from each section

The answers to the whole homework will be available Friday at 2pm.

Definitions
Please explain each term in three lines or less!

- Isoquant
- Isocost
- Marginal cost
- Marginal rate of technical substitution
- Economy of scale
- Edgeworth box
- Pareto efficient allocation
- Contract curve
- Price system

Word problems
Please explain each question in a few sentences.

- State the First Welfare Theorem, and describe in words how the allocation would look like in the Edgeworth box for a two person, two good exchange economy.
• A firm’s marginal rate of technical substitution captures the firm’s willingness to trade capital for labor, but not the degree to which capital and labor are substitutes in supply. True or false?

• Assume that, in a two-person (1 and 2), two-good (x and y), exchange economy, allocation A, (xA1, yA1, xA2, yA2), and allocation B, (xB1, yB1, xB2, yB2), are both Pareto efficient. Explain why, if consumer 1 prefers allocation A, then consumer 2 must prefer allocation B.

• A consumer in an exchange economy will always be better off at an allocation which is Pareto efficient than at an allocation which is not Pareto efficient. True or false?

• In a two-person, two-good exchange economy, explain why both consumers’ marginal rates of substitution are equal at every point on the contract curve.

Technical problems

1. Assume a two person, two good exchange economy.
   Mr. Blue’s utility function for goods x and y is given by: \( u_A = x^{0.7} y^{0.3} \)
   Mr. Red’s utility function for goods x and y is given by: \( u_A = x^{0.9} y^{0.1} \).

   Blue has 20 ounces of x and 10 ounces of y. Red has 15 ounces of x and 15 ounces of y.

   a) Calculate the marginal rate of substitution (MRS) of y for x for both consumers at the endowment point.

   b) Draw an Edgeworth box showing the endowment and indifference curves of the consumers.

   c) Assume that Blue and Red can trade at a market price as price-takers. Assume that x is the *numeraire* (i.e., \( p_x = 1 \)), what is the price of y? What is the final allocation of x and y?

   d) Show the trading in the diagram from part b.
2. Assume that a firm’s production function is given by \( Y = f(K, L) = 6K^{\frac{2}{3}} L^{\frac{1}{3}} \).

a) Derive the expression for the marginal rate of technical substitution (MRTS) for this production function.

b) Let the wage rate \( w \) be $4 and the rental rate of capital \( r \) be $16. Assuming that the firm is producing 54 units of output, what will be the cost-minimizing combination of labor and capital used by the firm? What will be the firm’s total cost of producing 54 units of output?

c) Derive the expressions for the short-run average cost of production. Does the firm have decreasing returns to scale?