Section Notes 11

Covering material from Lecture on February 16^{th}

Class Outline

1. Costs
2. Short Run Costs
3. Long Run Costs
4. Short Run vs. Long Run Production Decisions

1 Costs

There is a difference between **accounting costs** and **economic costs**. We are concerned with economic costs, which include the **opportunity costs**.

Sunk Cost:

A few general equations:

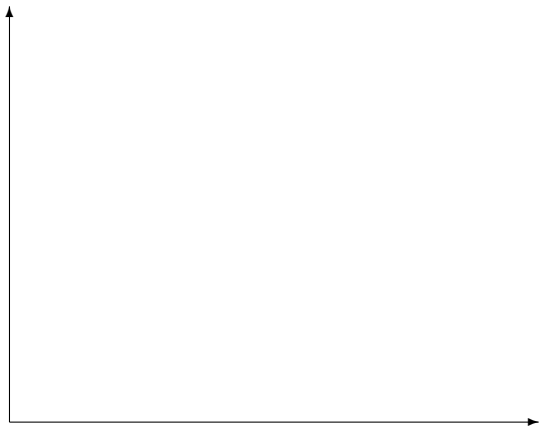
1. Total Cost: $TC = C(q) =$
2. Marginal Cost (MC): $MC =$
3. Average Total/Fixed/Variable Costs - All just divided by final quantity of output.

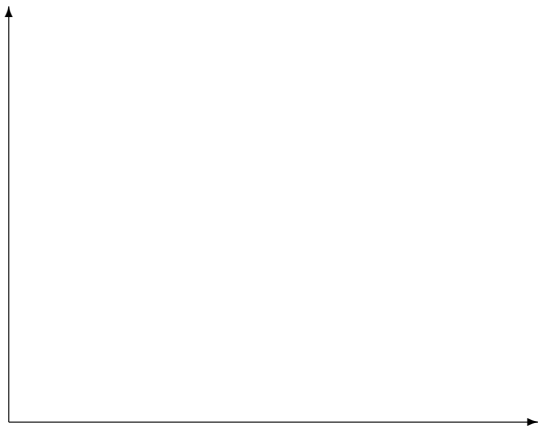
2 Short Run Costs

When we initially deal with costs of production, we are assuming that the costs of inputs are fixed. This is why we can write the costs purely as a function of quantity. For example, if we're in the **short run** (i.e. there is a single variable input) and our variable input has a fixed cost, how do we find the marginal cost?

NB: Thinking about this a little more, what is the relationship between diminishing marginal returns and marginal costs?

The relationship between diminishing returns and marginal costs can be seen well graphically.



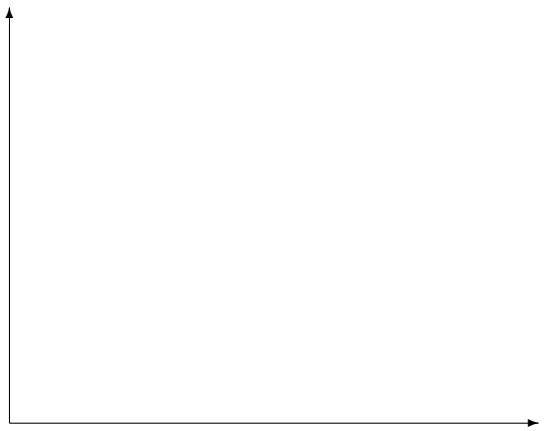


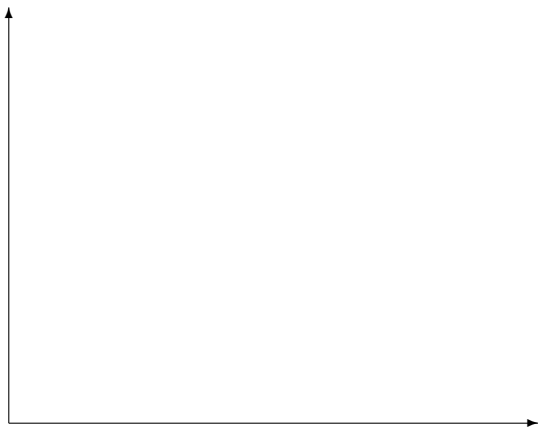
3 Long Run Costs

In this situation, we're letting both inputs vary. It's easy to conceptualize the cost of labor, but it's sometimes tricky to think about the cost of capital. As economists we should see that the cost of capital is the cost of depreciation of its use, plus the opportunity cost of letting someone else use it (i.e. interest rate times the value of capital). We denote the cost as r = Depreciation rate + Interest rate.

Isocost Line:

Let's spend some time analyzing some isoquant and isocost lines together.





4 Short-Run vs. Long-Run Production Decisions

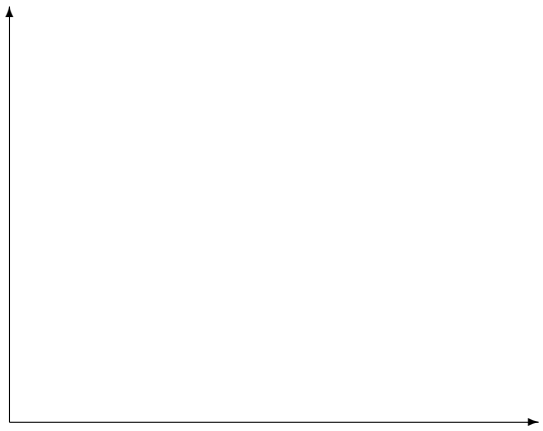
Problem: (P&R, Chapter 7, Exercise 11)
Suppose that a firm'sproduction function is $q = 10L^{1/2}K^{1/2}$. The cost of a unit of labor is \$20 and the cost of a unit of capital is \$80.

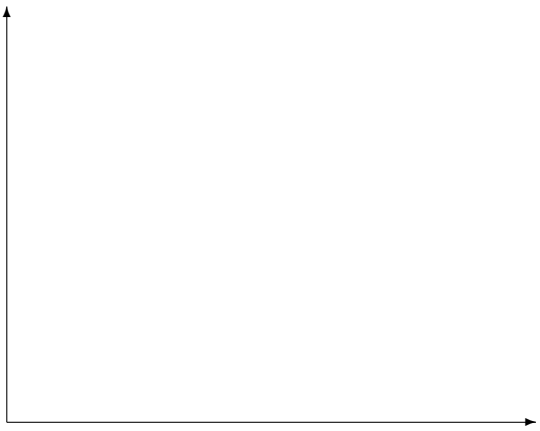
1. The firm is currently producing 100 units of output and has determined that the cost-minimizing quantitites of labor and capital are 20 and 5, respectively. Graphically illustrate this using isoquants and isocost lines.

2. The firm now wants to increase output to 140 units. If capital is fixed in the short run, how much labor will the firm require? Illustrate this graphically and find the firm's new total cost.

3. Graphically identify the cost-minimizing level of capital and labor in the long run if the firm wants to produce 140 units.

4. What is the marginal rate of technical substitution? Find the optimal level of capital and labor required to produce the 140 units of output.





Problem: (P&R, Chapter 7, Exercise 8)
You produce engines with a production function

$$q = 5KL.$$

Each assembly machine rents for $r = \$10,000$ per week, and each labor team costs $w = \$5000$ per week. The cost of raw materials for each engine is \$2000. You have a fixed number of 5 assembly machines.

1. What is the cost function of your plant? What are average and marginal costs for producing q engines? How do average costs vary with output?

2. How many teams are required to produce 250 engines? What is the average cost of production?

3. If you were to design a new facility, what capital to labor ratio (K/L) should the new plant accommodate if it wants to minimize the total cost of producing at any level of output q.