SS201: Principles of Economics
AY 23-2
Lesson 14: Costs of Production

1 Review

For each question below, select either True, False, or Uncertain. Then in the space provided, briefly justify your answer (one or two sentences maximum).

True False Uncertain

1. Excludable goods are those which people cannot be prevented from using.

True False Uncertain

2. Private goods and common resources are goods which are considered rival in consumption.

True False Uncertain

3. Whichever agent, consumers or producers, that is more elastic bears more of the tax burden when an ad valorem tax is implemented.

True False Uncertain

4. The United States and Brazil both produce t-shirts and leather belts. The United States has the absolute advantage in producing both goods; therefore, the United States should not trade with Brazil for either of these goods.

2 Bottom Line Up Front

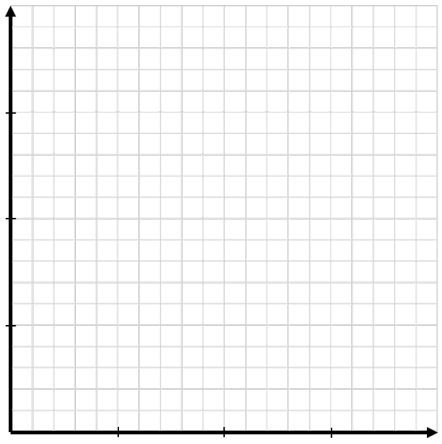
Economists look at costs differently. There are implicit, and explicit which inform how decisions bring about economic versus accounting profit. This lesson focuses on a firm's costs and provides a foundation for how they model their cost structure.

3 A Marginal Product of Labor Game

Congratulations! You all now work in my SS201 Forge! My Uncle Argyle recently passed and my friends Hamish, William, Stephen, and I recently inherited this blacksmith forge. I do not know much about running one of these things, so I first want to see how efficient we can be at making swords, and what the optimal number of laborers is. To make a sword, the iron must be taken from the ground and placed in the forge.

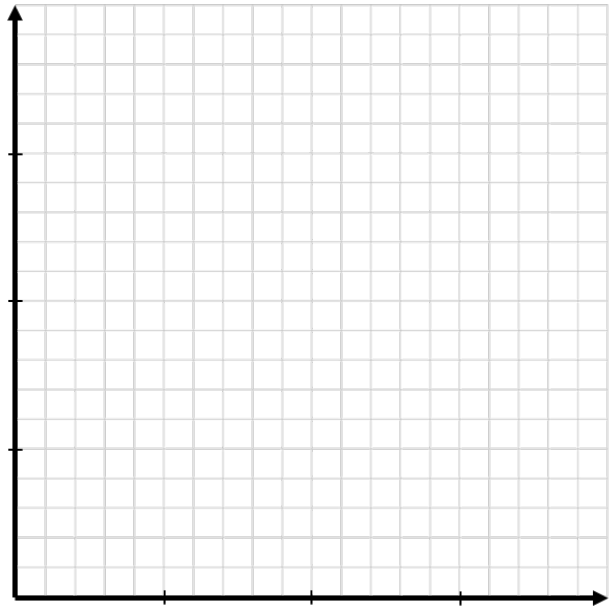
We will experiment with how many workers are optimal for this process. I am going to start with 1 and progress to 10. We will have 30 second rounds to see how many swords we can make. We will record and plot the results below.

Workers	Swords
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



1. Why did our *production function* of swords have this shape? Why does this make sense?

2. Assuming we pay each laborer the same wage, what would our *total cost curve* look like? What shape would it have? Graph it below.



4 Cost Terminology

Define the following and give an example of each for our blacksmith forge.

1. Fixed Cost (FC) & Average Fixed Cost (AFC)

2. Variable Cost (VC) & Average Variable Cost (AVC)

3. Total Costs (TC) & Average Total Cost (ATC)

4. Marginal Cost (MC)

5. Sunk Cost

Let's simplify the cost structure of the blacksmith forge. Assume that the weekly rent on our space is \$500, and that this is our only fixed cost. Assume that labor is our only variable cost, and we can hire workers at \$10 an hour. Weekly sword production as a function of workers is given below.

5. Complete the table.

Labor	Q (in 100's)	FC (in \$100)	VC	TC	AFC	AVC	ATC	MC	MC (Calculus)
0	0				—	—	—	—	0
10	1								1
40	2								6
150	3								17
400	4								34
850	5								57

6. What pattern do you observe in the MC column? How does this relate to question 1 on the front page?

7. The table above was generated from the total cost function: $TC = Q^3 - 2Q^2 + 2Q + 5$. Using this function, derive expressions (in terms of Q) for ATC, AVC, AFC, and MC.

8. A graph of our cost equations is given below. Label each curve (ATC, AVC, AFC, and MC).

9. Describe the shape of the ATC. Why does it have this shape?

10. What is the relationship between AFC, AVC, and ATC?

11. Where does the MC curve cross the ATC curve? Why does this make sense?

Using your academic GPA as an example:

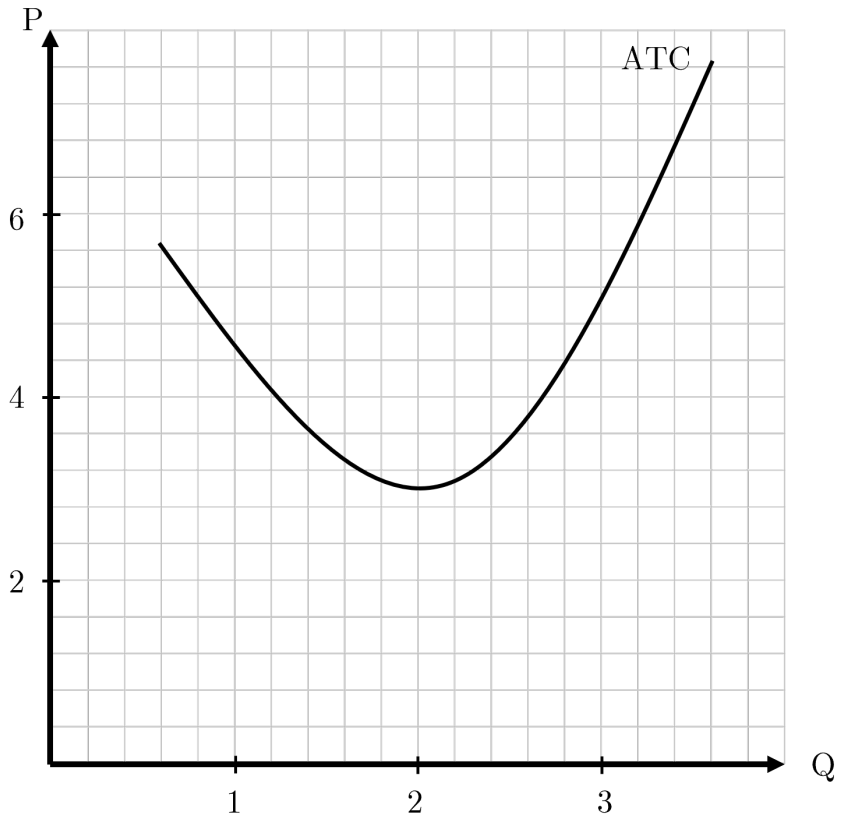
a) If your GPA is a 3.5 and you get an A in this course, your GPA will go up / down.
b) If your GPA is a 3.5 and you get a B in this course, your GPA will go up / down.
c) If your GPA is a 2.5 and you get a B in this course, your GPA will go up / down.

By the same logic, when MC $<$ ATC, ATC is _____ and when MC $>$ ATC, ATC is _____. Thus, the MC always intersects the ATC at the _____.

5 Profit

1. What is profit? Write an equation defining it.

Below is a graph of our ATC from above.



2. What is the ATC when Q=2? Suppose the we sold 2 (hundred) units at a price of \$5. Calculate our profit using the graph above. Shade in the profits as well.

3. Derive an expression for profit in terms of ATC and Q.