Office hours for professor and teaching assistants through Oct 24

James Hamilton	M 3:15-4:15, Th 2-3*	Econ 307
Vinayak Alladi	M 5-6	Econ 112
Martha Gimbel	Tu 10-11	Econ 117
Ayal Chen-Zion	W 4-5	Econ 112
Matthew Louie	Th 10-11	Seq 139
Roy Allen	Th 3:30-4:30	Econ 126
Soojin Jo	F 9-10	Seq 207

*Hamilton out of town Sep 29, Nov 3, and Nov 17

Chapter 9: Monopoly, Oligopoly, and Monopolistic Competition

A. Total revenue and marginal revenue

total revenue = total amount received from selling product (= PQ)

marginal revenue = additional revenue from selling one more unit

Whether total revenue increases when you decrease the price depends on elasticity

- If 10% price decrease leads to more than 10% gain in Q (elasticity > 1), then total revenue goes up.
- If 10% price decrease leads to less than 10% gain in Q (elasticity < 1), then total revenue goes down.

Special case: linear demand curve

$P = a - bQ$

a is the intercept

$-b$ is the slope

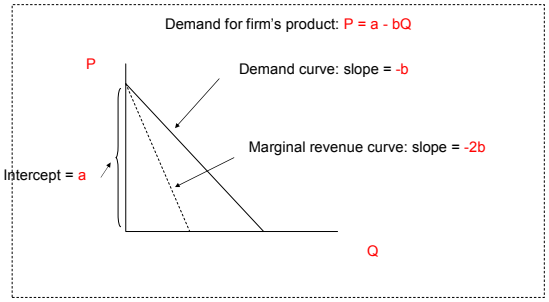
Marginal revenue:

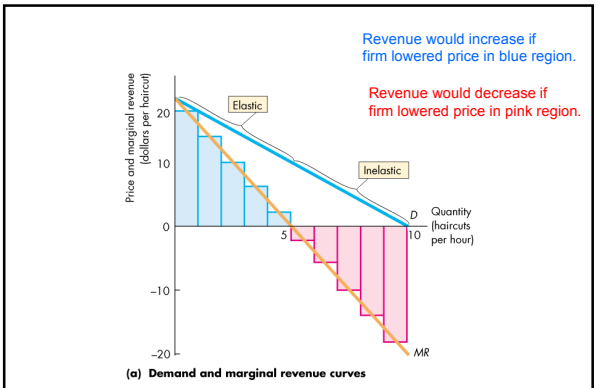
$a - 2bQ$

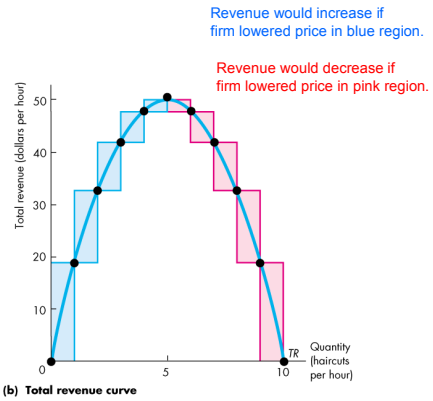
This is equation of a line where

a is the intercept

$-2b$ is the slope







Chapter 9: Monopoly, Oligopoly, and Monopolistic Competition

A. Total revenue and marginal revenue
B. Total cost, marginal cost and fixed cost

Definition:

total cost = total expenses firm would incur in order to produce quantity Q

marginal cost = additional cost of producing one more unit

$$\frac{\Delta(TC)}{\Delta Q} \text{ or } \frac{d(TC)}{dQ}$$

Q	Total cost	
1	4	
2	10	
3	18	
4	28	
5	40	
6	54	

Q	Total cost	Marginal cost
1	4	4
2	10	6
3	18	
4	28	
5	40	
6	54	

Q	Total cost	Marginal cost
1	4	4
2	10	6
3	18	8
4	28	10
5	40	12
6	54	14

Role of fixed costs

Example: to refine petroleum products, there is an enormous fixed cost (build refinery) but thereafter marginal cost of additional production is roughly constant up to the capacity of the plant

Suppose you build an oil refinery for $2 billion.

Each year you will have to pay interest on the debt, taxes, maintenance, insurance, etc. of say $200 million.

This $200 million per year is a fixed cost you pay even if you produce nothing.

For each gallon of gasoline you refine, you'll need to buy more crude oil, pay for more labor, energy, …

Suppose this marginal cost of producing each additional gallon of gasoline is $2 per gallon.

Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0				
100 M				
200 M				
300 M				
400 M				

Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0	$200 M			
100 M	$200 M			
200 M	$200 M			
300 M	$200 M			
400 M	$200 M			

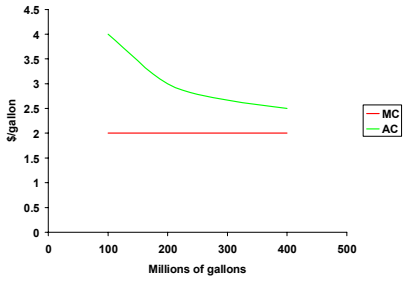
Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0	$200 M	$2/gal		
100 M	$200 M	$2/gal		
200 M	$200 M	$2/gal		
300 M	$200 M	$2/gal		
400 M	$200 M	$2/gal		

Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0	$200 M	$2/gal	$200 M	
100 M	$200 M	$2/gal	$400 M	
200 M	$200 M	$2/gal	$600 M	
300 M	$200 M	$2/gal	$800 M	
400 M	$200 M	$2/gal	$1000 M	

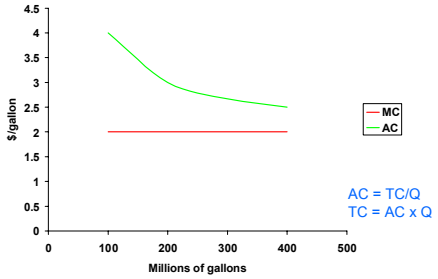
Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0	$200 M	$2/gal	$200 M	∞
100 M	$200 M	$2/gal	$400 M	$4/gal
200 M	$200 M	$2/gal	$600 M	
300 M	$200 M	$2/gal	$800 M	
400 M	$200 M	$2/gal	$1000 M	

Quantity (gals/yr)	Fixed cost	Marginal cost	Total cost	Average cost
0	$200 M	$2/gal	$200 M	∞
100 M	$200 M	$2/gal	$400 M	$4/gal
200 M	$200 M	$2/gal	$600 M	$3/gal
300 M	$200 M	$2/gal	$800 M	$2.67/gl
400 M	$200 M	$2/gal	$1000 M	$2.50/gl

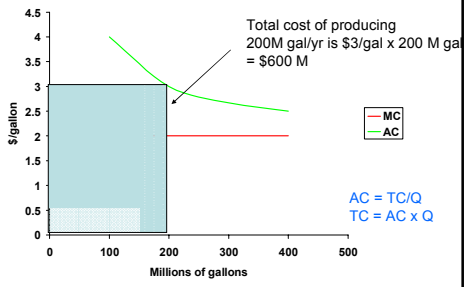
Marginal and average cost



Marginal and average cost



Marginal and average cost



Chapter 9: Monopoly, Oligopoly, and Monopolistic Competition

A. Total revenue and marginal revenue
B. Total cost, marginal cost and fixed cost
C. Profit maximization

Proposition: any firm maximizes profit by setting marginal revenue equal to marginal cost

First method of proof: calculus

TR = total revenue

TC = total cost

$TR - TC$ = profit

Firm maximizes profit by finding derivative of profit with respect to Q and setting it to zero

$$\frac{d(TR - TC)}{dQ} = 0$$

requires

$$\frac{d(TR)}{dQ} = \frac{d(TC)}{dQ}$$

or marginal revenue = marginal cost

Second method of proof: intuition

Suppose the firm wasn't following our advice, and operated at a level where MR > MC

Then if it produced one more unit:

- its revenues would go up by MR
- its costs would go up by MC
- if MR > MC, its revenues would go up by more than its costs if it produced one more unit
- Conclusion: if MR > MC, firm can increase profits by producing one more unit

Or, suppose instead the firm wasn't following our advice, and operated at a level where MR < MC

Then if it produced one less unit:

- its revenues would go down by MR (bad)
- its costs would go down by MC (good)
- if MR < MC, its cost savings more than make up for lost revenue
- Conclusion: if MR < MC, firm can increase profits by producing one less unit

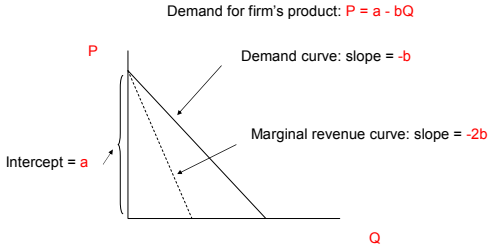
Combined implication: firm is only maximizing profits if it sets MR = MC

Chapter 9: Monopoly, Oligopoly, and Monopolistic Competition

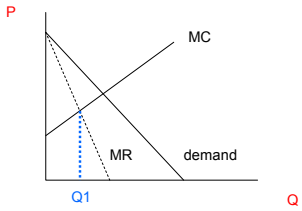
A. Total revenue and marginal revenue
B. Total cost, marginal cost and fixed cost
C. Profit maximization
D. Monopoly

Monopoly: one firm controls the entire market (firm demand curve = market demand curve)

Price and output decision for a firm that is a monopoly

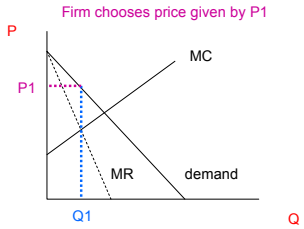


Monopolist will choose Q so that MR = MC



Firm chooses level of output given by Q1

Firm will charge highest price it can



Firm chooses level of output given by Q1

Observation: a monopolist would never choose to operate at a point where demand is inelastic

- will choose MR = MC
- MC > 0
- therefore MR > 0
- therefore demand elastic