Discussion 14

Important Topics

- Game Theory

    - Best Response
    - Dominant Strategy
    - Nash Equilibrium
    - Collusion Outcome
    - Maxmin Strategy

- Monnopolistic Competition

Warm Up Problem

The local Best Buy will only have one Nintendo Switch available for sale tomorrow. Bruce and Korinna Hansen both want to purchase the Nintendo, and can either get to the store early or late. Getting to the store early incurs a cost of $100, as they don't like to wake up early. If Bruce gets to the store early before it opens, he will get the Nintendo which he values at $1000, and Korinna will get nothing. If Korinna gets to the store early, she will get the Nintendo which she values at $700 and Bruce will get nothing. If they either both go early, or both go late, Bruce will get a value of $500 and Korinna will get a value of $350.

a. Draw the Payoff Matrix for Bruce and Korinna

<div align="center">

Korinna

		Early		Late	
		B: 400	K: 250	B: 900	K: 0
Bruce	Early	B: 400	K: 250	B: 900	K: 0
	Late	B: 0	K: 600	B: 500	K: 350

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b. Identify the Nash Equilibria
The only N.E. is when both go early.

c. Identify any Dominant Strategies
The dominant strategy for both is to go early.

d. What is the outcome if they play Maxmin strategies?
If Bruce goes early his worst outcome is 400. If Bruce goes late his worst outcome is 0. Therefore his maxmin is to go early.
If Korinna goes early her worst outcome is 250. If Korinna goes late her worst outcome is 0. Therefore her maxmin is to go early.

Problem 1

A parent with two children, Peyton and Eli, decide that each child is to decide the allowance that their sibling will receive. Eli can choose whether his elder brother's allowance will be $7 or $2, and Peyton can choose whether his younger brother's allowance will be $5 or $1. We will call these two outcomes as either the altruistic outcome or the selfish outcome.

a. Identify the Nash Equilibria
Every possibility is a nash equilibrium.

b. Identify any Dominant Strategies
There are no dominant strategies.

	Eli			
		Altruistic		Selfish
Peyton	Altruistic	P: 7 E: 5		P: 2 E: 5
	Selfish	P: 7 E: 1		P: 2 E: 1

Problem 2

A criminal steals a car on the isthmus in Madison. The criminal can choose to try and escape by driving east or west. The police are notified of the theft, however they only have enough time to set up a road block on either the east or the west side. If both the criminal and the police choose the same outcome, the police get a utility of 1000 by catching the criminal and the criminal gets a utility of -500 because they have to go to jail. If the criminal escapes the police get a utility of -200 (their reputation has taken a hit), and the criminal gets a utility of the value of the car which is X> 0.

		Police	
		East	West
Criminal	East	C: -500 P: 1000	C: X P: -200
	West	C: X P: -200	C: -500 P: 1000

a. Identify the Nash Equilibria
   There are no Nash Equilibria.

b. Identify any dominant strategies
   There are no dominant strategies

c. For what values of X is the collusion outcome (East, East) or (West, West)? For what values of X is the collusion outcome (East, West) or (West, East)? Interpret
   We rewrite the matrix with the total collusion payouts at each square:

		Police	
		East	West
Criminal	East	500	X-200
	West	X-200	500

Therfore if $500 > X - 200$ then the collusion outcome is either (East, East) or (West,West). Rearrange the inequality: $700 > X$
Similarly if $500 > X - 200$ then the collusion outcome is either (East,West) or (West,East). Rearrange the inequality: $700 < X$

The story is that if the criminal steals a very expensive car, it would be better to bribe the police officer so they go to opposite ends of the isthmus. Conversely if the criminal steals a cheap car it would be better for the criminal to plead guilty and agree to be captured by the police for a plea deal.

Problem 3 - Monopolistic Competition

Fiji water is a brand of artisinal bottled water with the following costs and demand:

- $TC = q^2 + 4$

- $MC = 2q$

- Demand: $P = 16 - q$

a. What quantity and price will this firm choose?
We solve the usual profit-maximization problem:

$$MR = MC \iff 16 - 2q = 2q$$

$$q* = 4$$

The corresponding price comes from the demand curve: $P = 16 - 4 = 12$

b. Does this firm have excess capacity?
Excess capacity is the amount of additional production possible while ATC is still decreasing. A firm has excess capacity if they are producing on the increasing returns to scale part of their average total cost. So, we solve for the minimum of the ATC curve by intersecting MC and ATC:

$$2q = q + \frac{4}{q}$$

$$q = \frac{4}{q}$$

$$q_{minATC} = 2$$

So in the short run we don't have excess capacity.

Monopolistic Competition
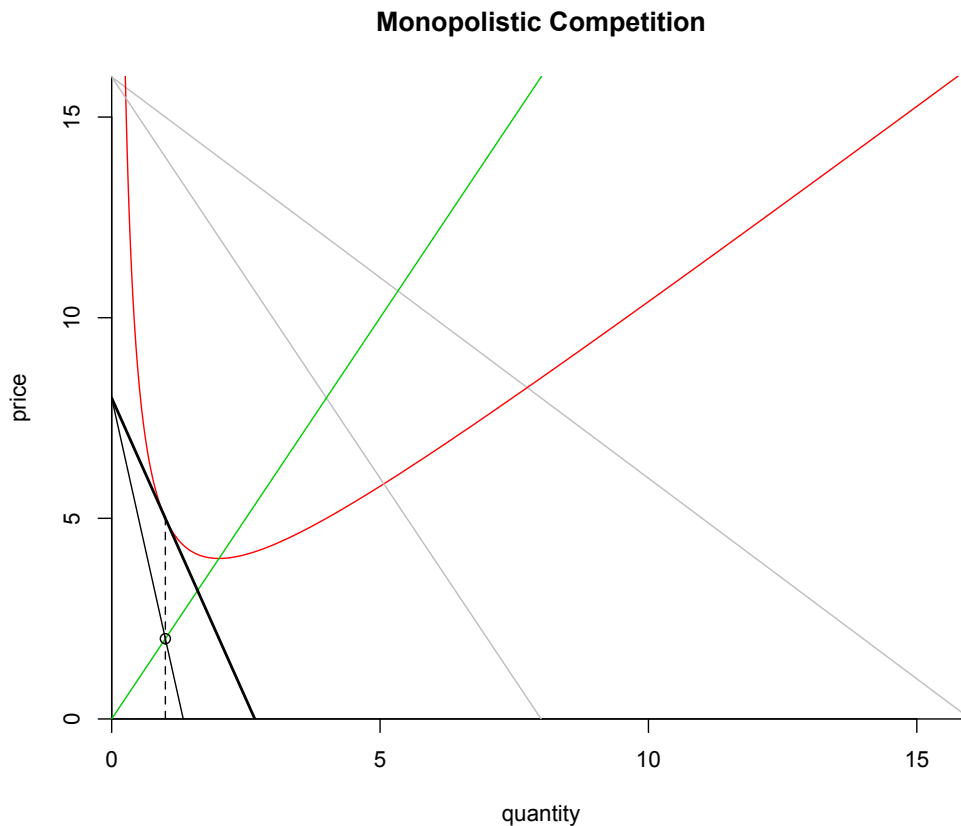
c. Solve for the firm's profit.
Total Revenue $= P * Q = 12 * 4 = 48$. Total Cost $= 4^2 + 4 = 20$. Profit $= \$28$.

d. What will happen in the long run? Comment on excess capacity.
   With free entry and positive profits, entry will occur in this differentiated goods market. As a result, the demand for Fiji water will decrease and profits will go to zero. In the long run there will be excess capacity. Use a graph to verify this. Note, solving for the new demand is not important. Just understand the dynamics and be able to draw the picture.
   In the figure below, observe that ATC (red) will lie tangent to the demand curve at the optimal quantity. This tells us AR=ATC so profits are zero.

Monopolistic Competition