

Econ 414, Exam 1

Name: _____

There are three questions taken from the material covered so far in the course. All questions are equally weighted. If you have a question, please raise your hand and I will come to your desk.

Make sure that you defend your answers with economic reasoning or mathematical arguments, and show that you are using the correct game theoretic concepts by identifying the equilibria explicitly.

Good luck.

1.

Consider the following game in strategic form:

| | | | | | |
|---|---|------|------|------|------|
| | | | | B | |
| | | w | x | y | z |
| | a | 4,2 | -3,3 | 0,4 | 2,-1 |
| | b | 2,0 | 2,-1 | -1,3 | 8,2 |
| A | c | 5,-2 | -2,2 | 1,0 | 7,-4 |
| | d | 4,10 | -5,4 | 0,5 | 3,3 |

- Perform iterated deletion of *strictly* dominated strategies (Strike the dominated strategy out with a line, writing the letter of the dominant strategy beside it).
- Find all pure-strategy Nash equilibria, or explain why not exist.
- If there is a mixed-strategy Nash equilibrium, find the equilibrium strategy for the row player.

2. Price Competition

There are consumers located uniformly on $[0, 1]$, so between any two points $0 < a < 1$ and $0 < b < 1$ with $b > a$, there are $b - a$ consumers there. There is a firm located at 0, who charges price p_0 , and a firm located at 1, who charges price p_1 . Consumers have preferences as

$$u(x, p) = \begin{cases} v - tx - p_0 & , \text{ Bought at 0} \\ v - t(1 - x) - p_1 & , \text{ Bought at 1} \end{cases}$$

The firm located at zero has total cost $C_0(q) = c_0q$, while the firm located at one has total cost $C_1(q) = c_1q$, with $c_1 > c_0$.

- i. Find the demand for each firm's product as a function of the prices they charge.
- ii. Write the firms' profit maximization problems, solve for best-response functions, and graph the best-response functions. Does the game have strategic complements or substitutes?
- iii. Solve for the Nash equilibrium in prices.
- iv. How does a change in c_0 affect the price that the firm located at 1 charges?

3. Mixed Strategy Equilibrium

There are two firms deciding whether to enter a market or not. The market for their good is extremely small, so it can only profitably support one firm in the long run. Here are costs and benefits:

- π_d — The discounted profits from being a duopolist
- π_m — The discounted profits from being a monopolist
- E — The cost of entry

Here's a strategic form:

| | | | Firm B |
|--------|-------|------------------------|----------------|
| | | Enter | Don't |
| | Enter | $\pi_d - E, \pi_d - E$ | $\pi_m - E, 0$ |
| Firm A | Don't | $0, \pi_m - E$ | $0, 0$ |

- What do you have to assume about π_d , π_m and E to ensure that (a) firms prefer to enter as monopolists rather than duopolists and (b) firms prefer not to enter if their opponent does.
- Solve for all pure or mixed Nash equilibria.
- How does an increase in E affect the probability that either of the firms enter?