

Name: _____

Quiz #1 –IO (October 6th, 2026)

Question #1 (5 Points)

Consider the following 2x2 game

		Player 2	
		L	R
Player 1	L	6,6	2,7
	R	7,2	0,0

- By inspection, what are the pure strategy Nash equilibria?
- Consider the probability β placed by player 1 on L and λ denote player 2's probability of playing L. Formulate the expected payoff of each player. Is there a mixed strategy Nash Equilibrium in this game?
- Draw the best-response correspondences. Where do they intersect?

Solution

- NE = {(L,R), (R,L)}
- Assume β is the probability that player 1 selects L and λ is the probability that player 2 selects L. Hence:

$$EU_1(L) = 6\lambda + 2(1-\lambda) = 2 + 4\lambda$$

$$EU_1(R) = 7\lambda + 0(1-\lambda) = 7\lambda$$

Hence, player 1 chooses L if $EU_1(L) > EU_1(R)$. That is, if $2 + 4\lambda > 7\lambda$ or $\lambda < 2/3$.

In addition,

$$EU_2(L) = 6\beta + 2(1-\beta) = 2 + 4\beta$$

$$EU_2(R) = 7\beta + 0(1-\beta) = 7\beta$$

Hence, player 2 chooses L if $EU_2(L) > EU_2(R)$. That is, if $2 + 4\beta > 7\beta$ or $\beta < 2/3$.

Therefore players' best response function are :

$$R^1(q) =$$

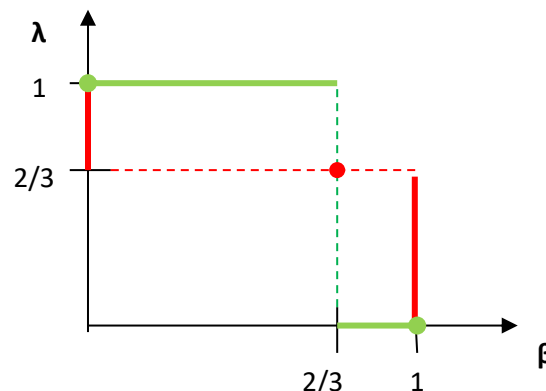
- L if $\lambda < 2/3$
- Randomizes between L & R ($\beta \in (0,1)$) if $\lambda = 2/3$
- R (L=0) if $\lambda > 2/3$

$$R^2(p) =$$

- L if $\beta < 2/3$
- Randomizes between L & R ($\lambda \in (0,1)$) if $\beta = 2/3$
- R if $\beta > 2/3$

The MSNE is player 1 randomizes between L and R if $\lambda = 2/3$ and player 2 randomizes between L and R if $\beta = 2/3$.

c)



Question #2 (5 Points)

Historically, most of the diamond mines in the world have been controlled by a few companies and governments. Through clever marketing by diamond producers, many consumers have furthermore become convinced that “diamonds are a girl’s best friend” because “diamonds are forever.” Suppose that the demand for diamond is given by $p=50-0.5q$ and suppose further that the monopolist’s marginal cost curve is given by $MC=q$.

- What is the profit-maximizing output level q^M ? What is the profit-maximizing price p^M (assuming that the monopolist can only charge a single per-unit price to all consumers)?
- Calculate the profit of this firm in a competitive equilibrium and compare it with the monopoly profit (part a).

Solution

- Hence $MR=MC$ (1), where MR is the marginal revenue and MC represents the marginal cost.
 $MR = \frac{\partial \pi}{\partial q} = 50 - q$ and $MC = q$. Therefore, the profit-maximizing output level q_M that solves (1) is $q_M=25$. Substituting q_M into the demand function we obtain that $p_M=37.5$.
- The competitive equilibrium can be calculated using $MC=p$, hence, $q=50-0.5q$. Therefore, $q^{PC} = 33.3\bar{3}$. The equilibrium price is $p^{PC} = 33.3\bar{3}$. Finally the profit of this firm in a competitive equilibrium is $\pi^{PC} = 33.3\bar{3} \times 33.3\bar{3} - \frac{(33.3\bar{3})^2}{2} \cong 555.55$. The monopoly the profit is $\pi^M = 25 \times 37.5 - \frac{25^2}{2} = 625$. Hence, the monopoly profit is higher than the competitive equilibrium.