

**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:

	w	x	B y	z
a	4,4	3,3	5,1	2,2
b	3,6	2,5	6,-3	1,4
A c	-2,0	2,-1	0,0	2,1
d	1,4	1,2	1,1	3,5

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

### 3. Cournot Competition with Different Costs

Assume there is a high cost firm, who has total costs  $C_h(q_h) = c_h q_h$ , and a low cost firm, who has total costs  $C_l(q_l) = c_l q_l$ , with  $c_h > c_l$ . The market price is  $p(q_h, q_l) = A - q_h - q_l$ .

- i. Write out the firms' profit maximization problems, and solve for their best-response functions and graph them. Does the game have strategic complements or strategic substitutes?
- ii. Solve for the Nash equilibrium strategies.
- iii. How does a change in  $c_l$  change the high cost firm's strategy?
- iv. How does a change in  $A$  affect the high cost firm's strategy? The low cost firm's strategy? Which firm's strategy is influenced more by a change in  $A$ ?

### 3. Mixed Strategy Equilibrium

Country A is planning an invasion of Country B. A can use its forces to attack beach North or beach South, and B's forces can defend North or South, but not both. If both countries choose to attack or defend the same beach, a battle occurs. Here are the pay-offs:

- W — Country A defeats B
- D — Country B is defeated
- $p_n$  — The probability country A wins if a battle occurs on the North beach
- $p_s$  — The probability country A wins if a battle occurs on the South beach

		B	
		North	South
		North	$p_nW, -p_nD$
North		$p_nW, -p_nD$	$W, -D$
A	South	$W, -D$	$p_sW, -p_sD$

- Find all pure and mixed Nash equilibria.
- If  $W$  and  $D$  change, how are the players' strategies effected?
- Show mathematically that if  $p_n$  goes up, country A is more likely to attack the North Beach, and country B is more likely to defend it.
- Explain in words why the result in part iii is true.