Econ 327: Game Theory

Final Exam

University of Oregon

December 8th, 2025

Version 1

- Complete *all* questions and parts. All questions will be graded.
- Carefully explain all your answers on short and long answer questions.

  An incorrect answer with clear explanation will earn partial credit, an incorrect answer with no work will get zero points.
- If you do not understand what a question is asking for, ask for clarification.

Allowed Materials:

- A single 5" by 3" note card
- A non-programmable calculator
- Pencils, color pens, eraser, etc.

Name _____

Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on the back of the page or another sheet of paper.

Multiple Choice

Question 1. (4 P.)
A player using a **mixed strategy** means that:

a) some parts of their strategy are played simultaneously and other parts are played sequentially
b) they are confused about what action their opponent is taking
c) they are internally uncertain about which action they will choose because they are acting randomly
d) they will regret not having chosen their a pure strategy instead

Question 2. (4 P.)
A game featuring **asymmetric information**:

a) has some players who have access to private information which is not directly observable to others
b) means that one player has a strategy with no equivalent strategy avaibable to any other player
c) has Nature acting as a player even though she doesn't have any preferences
d) is repeated multiple times by the same players

Question 3. (4 P.)
By **screening**:

a) a player attempts to learn about some private information held by others by designing an incentive mechanism
b) a player can reveal their own private information through their actions
c) only players with the 'bad' condition sort into a market
d) only mixed strategies will be played in equilibrium

Question 4. (4 P.)
An **information set**:

a) is used by game theorists to signal how they want their games to be played
b) tells a player what action to take
c) contains all decision nodes which a player cannot tell the difference between when they reach that part of the game
d) holds all pieces of information which are publically observable to all players

Question 5. (4 P.)
Consider the following lottery:

- with probability 1/4 you will receive \$1,600.
- with probability 3/4 you only receive \$16.

Suppose someone has a risk-averse utility function of $u(\$x) = \sqrt{\$x}$. For what certain amount of dollars, x, will this person be indifferent between taking the certain payment with probability of 1 and taking the lottery defined above?

a) \$169
b) \$412
c) \$484
d) \$808

Question 6. (4 P.)
In the **Prisoner's Dilemma**, mutual cooperation:

a) is a dominant strategy equilibrium

b) Pareto dominates the outcome of mutual defection

c) is stable

d) is a credible threat

Question 7. (4 P.)
The Folk Theorem states that:

a) Any individually rational and feasible outcome can be reached in a repeated game for some sufficiently high enough discount factor.

b) All Pareto optimal outcomes can always be reached in a Nash equilibrium.

c) No matter how hard you try, some folks will just never cooperate

d) The Prisoners' Dilemma is the only game with a unique Nash equilibrium.

Question 8. (4 P.)
Consider the strategic form game below:

		P_2		
		Left	Middle	Right
P_1	Up	0,1	9,0	2,3
	Straight	5,9	7,3	1,7
	Down	7,5	10,10	3,5

How many Nash equilibria exist in this simultaneous game, including both **pure** and **mixed** strategies?

a) One equilibrium

b) Two equilibria

c) Three equilibria

d) An infinite number of equilibria

Question 9. (4 P.)
Consider the Prisoners' Dilemma game with payoffs as shown in the strategic form table below:

		P_2	
		Split	Steal
P_1	Split	5, 5	-7,9
	Steal	9,-7	0, 0

Suppose Player 2 is utilizing a **Tit-for-Tat** strategy in which they will start off choosing Split, and after that they will play whatever strategy their oponent used in the previous round.
Which of the following represents Player 1's present value of Stealing in the first period and then Splitting in all following periods?
δ is the per-period discount rate.

a) $9 + 0\delta + 0\delta^2 + 0\delta^3 + ... = 9$

b) $5 + 5\delta + 5\delta^2 + 5\delta^3 + ... = \frac{5}{1-\delta}$

c) $9 + 5\delta + 5\delta^2 + 5\delta^3 + ... = 9 + 5\frac{\delta}{1-\delta}$

d) $9 - 7\delta + 5\delta^2 + 5\delta^3 + ... = 9 - 7\delta + 5\frac{\delta^2}{1-\delta}$

Question 10. (4 P.)
Consider the Prisoners' Dilemma game with payoffs as shown in the strategic form table below:

		P_2	
		Split	Steal
P_1	Split	8, 8	2,10
	Steal	10,2	4, 4

Suppose Player 2 is utilizing a **Grim Trigger** strategy in which they will start off by Splitting, and continue to split unless their opponent has ever played Steal, in which case they will play Steal in all periods following. Which of the following represents Player 1's present value of Stealing in the first period (and in all following periods)?

a) $10 + 4\delta + 4\delta^2 + 4\delta^3 + ... = 10 + 4\frac{\delta}{1-\delta}$

b) $8 + 8\delta + 8\delta^2 + 8\delta^3 + ... = \frac{8}{1-\delta}$

c) $10 + 8\delta + 8\delta^2 + 8\delta^3 + ... = 10 + 8\frac{\delta}{1-\delta}$

d) $10 + 2\delta + 8\delta^2 + 8\delta^3 + ... = 10 + 2\delta + 8\frac{\delta^2}{1-\delta}$

Long Answer

Question 11. (12 P.)
Consider the strategic form game below:

		P_2		
		Left	**Center**	**Right**
P_1	**Up**	3 , 3	1 , 0	0 , 2
	Medium	0 , 1	2 , 2	3 , 0
	Down	2 , 0	0 , 3	1 , 1

a) (4 P.) Find all **pure strategy** Nash equilibria. If there are none, explain how you know.

b) (4 P.) Now consider the strategy profile:

- Player 1 plays **Up 1/2** of the time, plays **Medium** the other **1/2**, and never plays Down
- Player 2 plays **Left 1/2** of the time, plays **Center** the other **1/2**, and never plays Right

Check whether this is a **mixed strategy Nash equilibrium** and explain why or why not.

c) (4 P.) Consider the following mixed strategy profile:

- Player 1 plays **Up 1/2** of the time, never plays Medium , and plays **Down** the other **1/2**
- Player 2 plays **Left 1/2** of the time, never plays Center, and plays **Right** the other **1/2**

Check whether this is a **mixed strategy Nash equilibrium** and explain why or why not.

Question 12. (8 P.)

Suppose that you are in charge of admissions for a prestigious school for elite musicians. You only want to admit the best students. Suppose that there are only two types of young musicians, *prodigies* and *normies*. The chance to attend your school would be life changing for everyone, so both types would receive 6,000 utility from attending your school. If you don't admit a student, they could still get a good (but not as prestigious) training at the state university's music program which they would get 4,000 utility from.
In order to allow you only admit the *prodigies* and not admit any *normies*, you can require a portfolio of N number of pieces that the applicants must submit to be considered. Suppose that *prodigies* have an easier time composing each piece because they are so talented. It costs *normies* 400 utility for each piece they prepare, but only costs 200 per piece for *prodigies*.

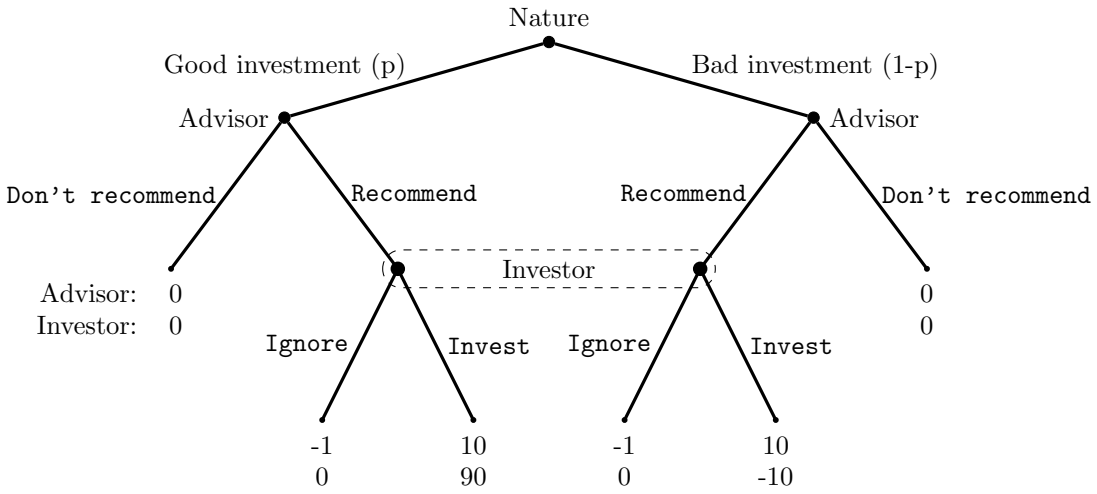
A) (4 P.) What is the minimum number N you could require so that only *prodigies* apply and *normies* don't apply? Explain your answer.

B) (4 P.) What is the maximum number N that you could require so that *prodigies* still want to apply?

Question 13. (12 P.)

Consider simplified model of asymmetric information in financial advising with two types of potential investment options; Good investments have positive returns, and Bad investments have negative returns. Assume the Investor does not know which type of investment will turn out to be good or bad, but they have a perfectly-informed advisor who can choose whether to recommend either type of investment. If the investor invests, they have to pay their advisor a 10% fee, but they take 90% of the return for themselves if it is good, and have to pay out of their own pocket if bad. The advisor loses nothing from not recommending either type of investment, but the time spent putting together a recommendation that their client does not invest in costs them an equivalent of 1% of the asset's value in time spent researching. Assume all players are risk-neutral.

The extensive form game is below:



a) (4 P.) Can there be any *separating equilibria* in this game where the Advisor always recommends good investments and never recommends bad investments? Why or why not?

b) (4 P.) Is there a *pooling equilibrium* where the Investor does invest? Solve for a range of p that describes when the Investor will choose to invest based on their expecation that their advisor will always recommend either investment type.

c) (4 P.) What is the *signalling* value of a recommendation from the Advisor? Is the Investor's updated belief of the recommended investment being Good any different from the original probability p in equilibrium? Why or why not?

Question 14. (16 P.)
Consider the strategic form game below:

		Column	
		Cooperate	Defect
Row	Cooperate	5 , 5	0, 7
	Defect	7 , 0	4 , 4

a) (4 P.) Describe the equilibrium when this game is a *one-shot* game. Is the equilibrium outcome Pareto efficient?

b) (4 P.) Describe how players' strategies might change if this game is repeated *infinitely*. Compare to your answer from part (a).

c) (4 P.) Suppose that one player is playing a *grim trigger* strategy in which they start by cooperating, but will always and forever Defect if the other player has ever chosen Defect.
Set-up (but do not solve yet) the *present value* of Defecting once and also the present value of Cooperating forever.

d) (4 P.) Suppose that both players have a *discount factor* of $\delta = 3/4$. Can a strategy profile of both players using *grim trigger* strategies be sustained in the game where the strategic form game above is repeated infinitely?
Show all calculations and explain your answer.