

Economics 414 – Midterm

Please answer ALL questions on this examination. Be sure to explain any non-standard notation that you use. Justify your answers!

1. (40%) Consider the following simultaneous move game:

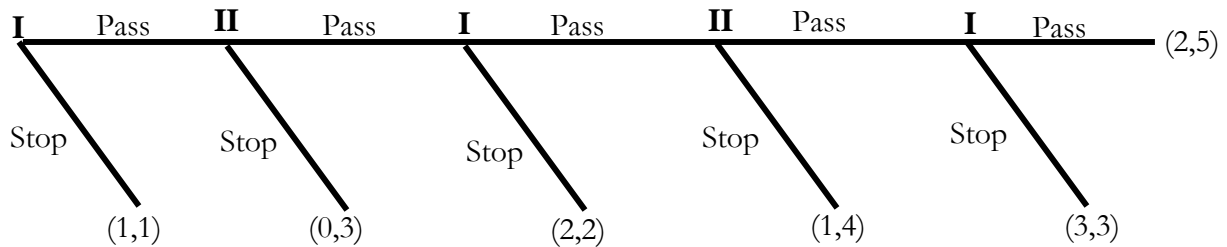
		Player 2		
		L	C	R
Player 1	T	(1, 1)	(4, -2)	(3, X)
	M	(0, 0)	(Y, 0)	(-2, 0)
	B	(-5, 5)	(5, 5)	(0, 6)

a. Is the following statement true or false? Explain your reasoning:

“Strategies that form a Nash Equilibrium have the property that they are optimal no matter the strategy of the other player.”

- b. In the game above, for what values of X is (T,R) a pure strategy Nash Equilibrium?
- c. For what values of Y does player 1 have a *strictly* dominated strategy?
- d. Now assume $X = 0$ and $Y = 5$. Find all pure strategy Nash Equilibria.

2. (30%) Consider the following extensive game with perfect information:



The game (known as the centipede game) moves from left to right and payoffs are denoted (X,Y) where X is player I's payoff and Y is player II's payoff.

- Write down all possible strategies of each player.
- Solve for the Subgame Perfect Nash Equilibrium.
- Is the following statement true or false? Explain your reasoning:

“Every extensive game with perfect information has a Subgame Perfect Nash Equilibrium.”

3. (30%) Consider 3 oligopolists facing the (inverse) demand curve $P = 16 - Q$, where $Q = q_1 + q_2 + q_3$. Assume that $C_i(q_i) = 0$ for all $i = 1, 2, \text{ and } 3$. Firms compete in the Stackelberg style with firm 1 choosing q_1 first. Then firm 2, after observing q_1 , chooses q_2 . Finally firm 3, after observing q_1 and q_2 , chooses q_3 .

- Find the best response functions of the 3 firms.
- Solve for the output choices of the 3 firms and resulting market price in the Subgame Perfect Nash Equilibrium.
- Suppose instead of quantity, firms sequentially choose their price as in a “price leadership” or “dynamic Bertrand” setting. What is the Subgame Perfect Nash Equilibrium?