ECO 4400 **Name (Print):** _____
Fall 2016
Exam 1
9/28/2016
Time Limit: 115 Minutes

This exam contains 6 short answer questions, 1 longer answer question, and 2 long answer questions. You must complete all short answer and longer answer questions; however, you only need to complete 1 of the long answer questions. Check to see if any pages are missing.

You may *not* use your books or notes on this exam. Calculators are permitted.

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Show your work**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, use the back of the pages; clearly indicate when you have done this.

Short Answer Questions: Please answer the following in no more than twenty words each.

1. (6 points) The assumption that all players are perfect calculators and flawless followers of their best strategies is referred to as what?

2. (6 points) Are simultaneous pricing games between firms continuous or discrete games?

3. (6 points) In sequential games, successful rollback analysis using backwards induction yields the rollback equilibrium and payoffs, equilibrium strategies, and .....

For questions 4,5, and 6, use the following graph (labelled as (d)):

(d)

		COLIN		
		West	Center	East
ROWENA	North	2, 3	8, 2	7, 4
	Up	3, 0	4, 5	6, 4
	Down	10, 4	6, 1	3, 9
	South	4, 5	2, 3	5, 2

4. (6 points) Does either player have dominated strategy? If so, what strategy or strategies are dominated?

5. (6 points) Is this game a constant sum game?

6. (6 points) Find any pure strategy Nash equilibria. Report the equilibrium strategies and payoffs.

Longer Answer Question: Please answer the following. Be sure to label any graphs.

1. (34 points) (Continuous Strategies) In this election cycle, there are two major candidates: Stein and Johnson. Stein spends x million dollars on advertising while Johnson spends y million dollars. Johnson's political ads are less effective than Stein's ads. Both candidates are competing for shares of votes. The more a candidate spends on ads, the more votes that candidate receives. Thus, the payoffs are represented by:

$$V_s = \frac{x}{x + ky} - x$$
$$V_j = \frac{ky}{x + ky} - y$$

where V_s is the payoff for Stein and V_j is the payoff for Johnson. The parameter k is greater than zero. Find the Nash Equilibrium.

Long Answer Questions: Please answer the following. Show all work. Draw graphs where needed. Only answer 1 of the 2 questions.

1. (30 points) (Simultaneous Games) Player 1, 2, and 3 are playing a game together. Players 1 and 2 each have four actions they can choose from: a, b, c, and d. Player 3 can choose X, Y, or Z. The players make their choices at the same time. Players 1 and 2 do not care about Player 3's decision at all. Also, Player 1's payoff is 1 if Player 2 does not make the same choice and 0 otherwise. Likewise, Player 2's payoff is 1 if Player 1 does not make the same choice and 0 otherwise. Player 3 prefers to play X if a player chooses a. He prefers to play Y if a player plays b. Finally, Player 3 prefers to play Z if a player plays c. If Player 3 does not play his preferred choice, he gets a 0 payoff. Find all Nash equilibria.

2. (30 points) (Sequential Games) There are two players attempting to split 4 dollars. The first player, the Proposer, offers some amount of money to the second player, the Respondent. The Proposer can offer the Respondent any amount of the 4 dollars (only whole dollars) in the first round. If the Respondent accepts the deal (or plays "Accept"), then the game is over. If the Respondent rejects the deal, then the Proposer can either choose to split the 4 dollars evenly or not. If the Proposer chooses to not split the money, the game ends and neither player receives any money. If the Proposer splits the money, then the game ends with each player receiving half of the total money.

   (a) (15 points) Draw this game in extensive form.

   (b) (15 points) Circle the rollback equilibrium or rollback equilibria. Report these equilibrium or equilibria by listing all the equilibrium strategies for both players and the equilibrium payoffs.