Department of Agricultural & Applied Economics
Microeconomics Qualifying Exam (Retake)
July 17, 2017
9:00 a.m. to 2:00 p.m.

Your **810 Code #** _____

Please provide complete answers to all questions. You have 5 hours to complete the exam; allocate your time accordingly. Please follow all instructions listed below:
- Number your responses to the questions clearly.
- Write the last 4 digits of your Student ID number at the top right of each response page.
- Write the page number in the lower right hand corner of each response page.
- Write your answers legibly and orderly. Illegible writing may cause your answers to not be correctly credited.
- Write only on one side of paper with a blue or black pen.
- Clearly box all final answers to numerical and algebraic problems

Question 1
(1.1) State the standard properties of a profit function $\pi(p, w)$.

(1.2) Consider the production function $f(z_1, z_2) = \sqrt{z_1} + 2\sqrt{z_2}$ where input prices (w_1, w_2) are strictly positive $((w_1, w_2) \gg 0)$ and the output level is $q \geq 0$. Solve for (i) the cost function, (ii) conditional factor demands, (iii) the profit-maximizing input and output levels given an output price p.

Question 2
Consider a two-consumer, two-good pure exchange economy. Consumer 1 has a preference relation represented by the utility function: $U_1(x, y) = x^2 y$ for $x \geq 0$ and $y \geq 0$. Consumer 2 has a preference relation represented by the utility function: $U_2(x, y) = x^2 y$ for $x \geq 0$ and $y \geq 0$. Consumer 1's endowments for each good are $x = 5, y = 15$. Consumer 2's endowments for each good are $x = 15, y = 5$. *Note: For parts 1-3 below you do not need to give any explanations or proofs beyond the requirements stated.*

(2.1) Construct an Edgeworth box diagram to scale. Be sure to show and label the endowment allocation and typical indifference contours/sets including the directions of increasing preference for each consumer.

(2.2) Characterize the set of Pareto Efficient allocations and illustrate them on your diagram.

(2.3) Identify the competitive (Walras) equilibrium allocation including the equilibrium prices and illustrate it on your diagram.

Question 3
(3.1) A freshman student in a microeconomics course involving no calculus (i.e. only basic supply and demand and cost curve graphs are taught) is learning about the difference between different market structures. Clearly explain to the student using appropriate graphs and simplifications the differences between Bertrand competition, Cournot competition, competitive markets, and a monopoly. Key issues

that should be explained include (but are not limited to), equilibrium prices and quantities and welfare. *Note: 3 pages max to answer this question.*

(3.2) Consider a Cournot game with 2 firms. The market inverse demand curve is given by $P(Q) = 500 - Q$, where $Q = q_1 + q_2$ and q_i is the quantity produced by firm i. Each firm's total cost is linear $C_1(q_1) = q_1$ and $C_2(q_2) = q_2$, respectively. What is each firm's best response as a function of the other firm's output? Graph these best response function on the same graph. Calculate the Nash Equilibrium and indicate it on the graph. Compute the associated payoffs for each firm.

(3.3) Calculate the cooperative equilibrium in which the two firms collude to behave like a monopolist. Is the cooperative solution a Nash Equilibrium?

Question 4
Consider an agent with logarithmic utility, U(w)=ln(w), and an initial wealth of $100,000 to invest. The agent has two assets to choose among (all $100,000 must be invested across the two available assets). The first is Google stock. Currently Google stock is trading in the market at $2 per share and has even odds of either staying at $2 or increasing to $4 one year from today. The second asset is a type of option. This asset returns $0 if Google stock moves up to $4 and returns $1 if the stock stays at $2. The price of the option is $0.25.

(4.1) Given the assumed utility function, what type of attitude towards risk does the agent have? What is the agent's Arrow-Pratt measure of absolute risk aversion?

(4.2) Graphically illustrate the payoff tree for the agent's portfolio letting x_G denote the number of dollars invested in Google stock and x_O denote the number of dollars invested in the Option.

(4.3) Solve for the agent's optimal investment in the two assets (fractional purchases are ok).

(4.4) If the investor was offered the opportunity to put her money in a savings account that guarantees a 50% return, R=(1+r)=1.5, would the investor prefer to invest in the savings account or Google Stock? Why? *Note: 2 sentences max for this question.*

Question 5
Consider the following "Battle of the Sexes" game

husband \ wife	Football	Antiques
Football	6, 3	3, 2
Antiques	-2, 1	4, 7

(5.1) Find all pure strategy Nash equilibriums.

(5.2) Calculate the probabilities necessary for the mixed strategy Nash Equilibrium. Be sure to explicitly state which probabilities are used by which players.

(5.3) Suppose instead of playing simultaneously, consider a sequential version of this game. Suppose the wife decides in the first stage which pure strategy to play and the husband decides in a second stage. Represent the game in extensive form and solve for the subgame perfect equilibrium of the game.