

Department of Agricultural & Applied Economics
Microeconomics Qualifying Exam

May 25, 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) Derive and explain the Engel Aggregation associated with a demand system for n commodities (Hint: Recall, the Engel Aggregation starts with the budget identity).
- (1.2) Let a consumer's preference relation be represented by the function $U(x_1, x_2) = x_1^{3/5} x_2^{4/5}$. Set up and solve this consumer Utility Maximization problem. Find the arguments that optimized the function and the optimal value function. List and *demonstrate* 4 of the properties of this optimal value function. Find the dual to the optimal value function in the simplest way possible.

Question 2

Consider a two-consumer, two-good pure exchange economy. Consumer 1 has a preference relation represented by the utility function: $U_1(x, y) = x^2 + y^2$ for $x \geq 0$ and $y \geq 0$. Consumer 2 has a preference relation represented by the utility function: $U_2(x, y) = x + y$ for $x \geq 0$ and $y \geq 0$. Consumer 1's endowments for each good are $x = 0, y = 20$. Consumer 2's endowments for each good are $x = 20, y = 0$. *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 on the graph paper provided. 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

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 perfect competition and monopoly. The student is trying to understand how short- and long-run (i) prices, (ii) quantities, and (iii) profits behave when there is a positive demand shift under different types of market competition. Graphically illustrate and explain i-iii in the short- and long-run for the case of (a) a market with perfect competition and (b) a monopoly.

Question 4

Assume there are ten firms operating in a perfectly competitive marketplace employing the technology $q = 4\bar{K}L^{1/4}N^{1/4}$ where K , L , and N denote capital, labor, and a natural resource respectively. Let $\bar{K} = 2$, the wage rate $w = \$10$, the price of the natural resource $h = \$40$, and the rental rate of capital $r = \$50$.

- (4.1) Derive the individual and market short-run supply functions.
- (4.2) Find and graph the market equilibrium if inverse demand is given by $P(Q) = 500 - 0.5Q$.
- (4.3) Calculate individual firm profits and determine if the market is in long-run equilibrium (given the fixed level of capital \bar{K}).

Question 5

Consider a market characterized by the demand function $Q = 1 - P$ and a monopolist with a constant marginal cost c . There is a potential new firm that could enter the market. The potential entrant has the same marginal cost as the incumbent, c , but has a fixed entry cost $F = 0.1$. If the new firm enters the market, the incumbent firm has two options, play “passive” or play “aggressive”. If the new firm enters and the incumbent is “passive”, then Cournot competition is played. Alternatively, if the new firm enters and the monopoly plays “aggressive” by producing the competitive output (i.e., the quantity such that $P = c$), the new entrant will have losses if it enters the market. If the new firm does not enter, the incumbent firm behaves as a monopolist.

- (5.1) Assuming that the marginal cost $c = 0$, compute the profits for both firms under (i) Monopoly, (ii) Cournot duopoly, and (iii) if the new firm enters and the incumbent plays “aggressive”.
- (5.2) Represent the game in extensive form where in the first stage the new entrant decides to enter or not enter. In the second stage the incumbent chooses to be passive or aggressive if entry occurs and continues as a monopoly if no entry occurs.
- (5.3) Find the subgame perfect equilibrium of the game. Is the threat by the monopolist to be aggressive credible?
- (5.4) Represent the game in normal form. Find the Nash equilibria of the game. Are there any N.E. that are not subgame perfect?