REVIEW QUESTIONS FOR FIRST EXAM

1. For a market demand curve expressed as the linear function \( P = a - bQ \) and a market supply curve expressed as the linear function \( P = c + dQ \), derive the algebraic expression for the competitive equilibrium quantity exchanged (\( Q^* \)) and the competitive equilibrium price (\( P^* \)).

2. For a market demand curve expressed as the linear function \( P = a - bQ \) and a market supply curve expressed as the linear function \( P = c + dQ \), use supply and demand graphs to show the direction of change in \( P^* \) and \( Q^* \) when \( a, b, c, \) or \( d \) increases, ceteris paribus. Determine the sign of the first derivative of \( P^* \) and \( Q^* \) with respect to \( a, b, c, \) and \( d \) (that’s eight derivatives) and confirm that the sign (+ or -) of each derivative is consistent with the change in \( P^* \) and \( Q^* \) shown in your graph.

3. Write the formula for calculating price elasticity of demand. Be sure that you understand how to do a numerical elasticity calculation if you are given either: 1) two points on a demand curve (called “arc” or interval elasticity), or one point on a demand curve and the slope of the demand curve (\( \frac{\Delta P}{\Delta Q} \)) through that point (called point elasticity).

4. For a linear demand curve given by \( P = a - bQ \), show algebraically (not just with a numerical example) that: 1) price elasticity varies as the midpoint of a demand interval varies along the demand curve, and 2) price elasticity equals one for any demand interval centered on the midpoint the demand curve.

5. Explain the relationship between price elasticity of demand and the direction of change in total expenditures (\( PQ \)) as price and quantity varies along a demand curve. For the case of a linear demand curve expressed as \( P = a - bQ \) derive the equation for the total expenditures curve and show how a graph of the total expenditures curve is positioned under the demand curve. Explain why the slope of the total expenditures curve depends on price elasticity of demand.

6. State the consumer's constrained optimization problem.

7. State the consumer’s budget equation as a linear function \( Y = f(X) \), where \( Y \) is the quantity of good \( Y \) and \( X \) is the quantity of good \( X \). Identify the \( Y \)-intercept and slope components of this linear equation. Plot a budget line in commodity space. Label the \( Y \)-axis and \( X \)-axis intercept points and describe what these points represent.

8. What causes a budget line to shift? Explain your answer with carefully labeled graphs.

9. List and explain the three basic axioms that are used in developing the theory of consumer behavior.

10. What is an indifference curve? List the four characteristics that describe indifference curves in two-good commodity space. How do we explain or justify these characteristics? Briefly explain what is meant by the "composite-good convention" when using indifference curve diagrams.

11. What do indifference curves look like if the commodity plotted on the \( y \)-axis is a good but the commodity plotted on the \( x \)-axis is a "neuter"? What if the commodity plotted on the \( x \)-axis is a "bad"?

12. Define Marginal Rate of Substitution (MRS\(_x\)). Explain what diminishing Marginal Rate of Substitution means and how this relates to the shape of an indifference curve.

13. Explain how a consumer should choose an optimal consumption point in two-good (\( X,Y \)) commodity space. Show this result on a graph for both an "interior solution" and for a "corner solution." What formal algebraic expression describes this situation for an interior solution? Be sure you can show how the optimal consumption point is determined if \( X \) represents a neutral commodity or a bad.

14. What is an income-consumption curve (ICC)? Using carefully labeled graphs, illustrate how an ICC is constructed for the following cases: 1) \( X \) and \( Y \) are both normal goods, 2) \( X \) is a normal good and \( Y \) is an inferior good, 3) \( X \) is an inferior good and \( Y \) is a normal good. Explain how Engel Curves can be derived from the information contained in an ICC. Draw the two Engel curves associated with each of the three cases mentioned above. Explain why it doesn't make sense to talk about the case of two inferior goods.
15. What is a price-consumption curve (PCC)? Use carefully labeled graphs to illustrate how a PCC is constructed and to illustrate how the information contained in the price-consumption curve is used to derive an individual consumer's demand curve.

16. As a consumer moves down a negatively sloped demand curve the level of satisfaction (utility) must increase. Using the relationship between movements along a demand curve and movements along a corresponding price-consumption curve, explain why this statement must be true. Show that consumer welfare measured by "consumer surplus" also increases as a consumer moves down a demand curve.

17. Use budget lines and indifference curves to illustrate the determination of a consumer’s optimal consumption point at the two end points of the demand curve, when \( X^* = 0 \) (at the top of the demand curve) and when \( P_X = 0 \) (at the bottom of the demand curve).

18. Using a graph to illustrate your answer, explain how the total effect of a change in the price of good X can be divided into a substitution effect and an income effect for the following three cases: 1) X is a normal good, 2) X is an inferior good but not a Giffen good, 3) X is a Giffen good. Is it possible for a normal good to be a Giffen good? If the economic theory of consumer choice does not preclude the existence of Giffen goods, how can economists justify stating that there is a Law of Demand?

19. How is price elasticity of demand related to the shape of the price-consumption curve? What does this imply about the shape of the price-consumption curve associated with a linear demand curve? Be sure that you understand the relationship between price elasticity, the price-consumption curve, the demand curve, and the total expenditures curve for an individual consumer.

20. Be sure that you understand the “coupon rationing of gasoline” application of consumer theory that we worked through in lecture.

21. Suppose the market demand curve for a good can be expressed as \( P = 100 - .5Q_d \) and the market supply curve can be expressed as \( P = 25 + 2Q_s \).

   a. What is the competitive equilibrium quantity (Q*) in this market?
   b. What is the competitive equilibrium price (P*)?
   c. What is the price elasticity of demand for any demand interval centered on the point \( P = 50 \)?
   d. What is the price elasticity of demand for any demand interval centered on the point \( P = 60 \)?
   e. Given the demand equation above, what is the equation representing the total expenditures (PQ) curve? Is the slope of the PQ curve positive, zero, or negative at the point \( P = 50 \)? At the point \( P = 60 \)? Do total expenditures increase, decrease, or remain the same if price increases from \( P = 50 \) to \( P = 60 \)?
   f. If a price floor is set at \( P = 50 \), what is the predicted quantity exchanged in this market?
   g. If a price ceiling is set at \( P = 50 \), what is the predicted quantity exchanged in this market?

These review questions are simply to help you organize your thoughts and focus your studying. They are NOT an exhaustive set of potential exam questions. It is important to remember that your performance on written answer exams depends partly on your understanding of the material and partly on your ability to communicate your knowledge effectively and efficiently. In economics, the use of graphs is a primary communicative tool. An important part of your preparation for this exam should be practicing drawing the graphs on blank sheets of paper without peeking at your notes or the text. Always label the axes on graphs. Never assume that the person grading your exam will know what you are thinking and thus fail to include a crucial part of an answer.