

University of Wisconsin-La Crosse
Department of Economics
ECO308 Intermediate Microeconomic Theory
Associate Professor Giddings
Fall 2011

Problem Set I: Due September 13th

Instructions: There are three parts to this assignment: the first part focuses on basic algebra, the second part focuses on the basics of multivariate calculus, and the third part focuses on the supply-demand model from your introductory economics courses. Form groups of five, and answer each of the following questions. Each group should turn in one version of the homework answers. Each question carries equal weight.

Part 1: Algebra Basics

1. Solve the following for x :

$$\frac{6x - 7}{4} + \frac{3x - 5}{7} = \frac{5x + 78}{28}$$

2. Solve the following for x :

$$\frac{3}{4}x + \frac{5}{6} = 5x - \frac{125}{3}$$

3. Solve the following for x :

$$\sqrt{x - 8} = 3$$

4. Solve the following for x :

$$\frac{1}{x - 3} + \frac{1}{x + 3} = \frac{10}{x^2 - 9}$$

5. Solve the following for x :

$$2(3x - 7) + 4(3x + 2) = 6(5x + 9) + 3$$

6. Solve the following for x :

$$\frac{x-3}{y} = \frac{x+3}{m}$$

7. Simplify the following expression:

$$5(6x - (6 - 7y + 7x) + 7y)$$

8. Solve the following for x :

$$9[8 - (3x - 3)] + 8x = 0$$

9. Assume x and y are nonnegative. Simplify the following expression:

$$(8x^{10}y^{11})^{1/3}$$

10. Solve the following system of equations for x :

$$\begin{aligned} -8x + 3y &= -125 \\ 8x + 3y &= 83 \end{aligned}$$

Part 2: Multivariate Calculus

11. Differentiate the following function with respect to x :

$$f(x) = 12x^3 + 4x^2 + 5x + 25$$

12. Differentiate the following function with respect to x and y :

$$f(x, y) = 5x^2 + 3y^2 + 7xy + 3x + 5y$$

13. Differentiate the following function with respect to x (use product rule):

$$f(x) = 4x\sqrt{5x}$$

14. Differentiate the following function with respect to x (use quotient rule):

$$f(x) = \frac{8x}{9x^3}$$

15. Differentiate the following function with respect to x :

$$f(x) = 7x^{5/2}$$

Part 3: The Supply-Demand Model

16. Define the laws of demand and supply.

17. Consider the market for chicken.

- a. Draw the supply-demand model. Correctly label the axes and curves, and identify the equilibrium price and quantity.
- b. Suppose buyers' incomes rise due to economic growth in the United States. Graphically illustrate the effect of the income change on the market for chicken. Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity. (Hint: you may need to make an assumption).
- c. Suppose the price of beef increases. Graphically illustrate the effect of the change in the price of beef on the market for chicken. Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity. (Hint: you may need to make an assumption).
- d. Suppose Tyson Inc., a well-know processed chicken producer, successfully lobbies a group of corrupt politicians to provide consumers with a subsidy to purchase chicken. Graphically show how the subsidy affects the market of chicken. Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity. In general, what is the rationale for a subsidy?
- e. Suppose the Cattle Farmers' Association induces a group of corrupt politicians to impose a tax on chicken in order to encourage the consumption of beef. Graphically show how the tax affects the market of chicken. (Assume the tax is collected from producers.) Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity. In addition, identify the burden of the tax (or tax incidence) and tax revenue.
- f. Suppose the price of chicken feed decreases. What effect would this have on the market for chicken? Graphically illustrate the effect of the change in the price of chicken feed on the market for chicken. Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity.
- g. Suppose the price of barbeque sauces increase. What effect would this have on the market for chicken? Graphically illustrate the effect of this change on the market for chicken. Show the shift(s) in demand and/or supply and the impact on the equilibrium price and quantity.

18. **Hypothetical Scenario:** A hurricane has recently hit the Gulf Coast of the United States. The majority of the nation's oil refining capacity is also located in this region and, as a result, there will be consequences in the market for gasoline. What do you expect to happen in the market for gasoline? Specifically, why would you expect a large up or down movement in the price of gasoline? In your answer explain why you would expect the supply and demand curves for gasoline to be more (or less) elastic.

Senator E. Diot wants government to get involved in the market for gasoline, in the wake of this disaster, to “save the people from the vicious, price-gouging gasoline suppliers.” E. Diot proposes price control measures in the market for gasoline. What sort of price control is the Senator most likely to propose? In what way would this help (some) consumers of gasoline? What will be the most likely effect of this price control? Draw a graph of the supply and demand model under price control to help substantiate your claims. What is your policy recommendation? Justify your policy recommendation.

19. Market research has revealed the following information about the market for chocolate bars: The demand schedule can be represented by the equation $Q^D = 1,600 - 300P$, where Q^D is the quantity demanded and P is the price. The supply schedule can be represented by the equation $Q^S = 1,400 + 700P$, where Q^S is the quantity supplied. Calculate the equilibrium price and quantity in the market for chocolate bars.

BONUS PROBLEMS

20. Solve the following for x :

$$\sqrt{x + 8} + \sqrt{x + 15} = \sqrt{9x + 40}$$

21. Solve the following for x :

$$2x^2 - x - 1 = 0$$