ECON 110, Professor Hogendorn

Problem Set 1

Note that all problem sets include both problems to turn in and review problems. Look over the review problems before working on the problem sets, because often they contain material showing you how to do the problems. Also, note that the review problems tend to be older, so they contain examples that are less current.

1. *HardBop.* Identify the following as positive or normative statements:

   (a) "Hard bop" jazz music causes warts and hearing loss.

   (b) Free jazz music is an unparalleled musical experience.

   (c) The U.S. unemployment rate is lower than this time last year.

   (d) The U.S. unemployment rate is still too high.

   (e) Unemployment in teenage labor markets would go up if the minimum wage were raised.

   (f) The government should raise the minimum wage.

2. *Electricity.* Let a typical household receive a benefit, measured in dollars, from consuming k kilowatt hours of electricity equal to $u(k) = 2.7k^{2/3}$. The opportunity cost of each kilowatt hour is 0.20 dollars spent.

   (a) What is the value of electricity to this household, measured as total benefit minus total opportunity cost? What quantity of electricity should the household consume in order to maximize its value of electricity?

(b) Graph the value of electricity function and show the optimum found in part (b).

(c) Graph the marginal benefit and marginal opportunity cost of electricity and show the optimum found in part (b).

3. *SUVs.* This question asks you to analyze the market for Sport Utility Vehicles (SUVs) using a *nonlinear* demand curve. The demand function (measured in hundreds of thousands of vehicles) for SUVs turns out to be $Q_d = 4027P^{-1.5}$, where P is the price of a typical SUV (in tens of thousands of dollars).

   (a) What are the first and second derivatives of this function? Graph the function and explain how the first and second derivatives relate to the shape of the graph.

   (b) The supply of SUVs turns out to be $Q_s = 258.3p$. What is the equilibrium price and quantity?

   (c) Suppose that the price of gas rises. Which of the following is more likely to be the new demand curve for SUVs? Why?

$$Q_d = 4300P^{-1.5} \qquad Q_d = 3700P^{-1.5}$$

   (d) Calculate and graph what happens to the equilibrium price and quantity after the demand curve changes.

Review Problems only, not to turn in:

4. *Shifters.* Illustrate and explain the impact on equilibrium market price and quantity exchanged of each of the following changes:

   (a) An improvement in the technology of production

   (b) An increase in individuals' desire for the good

   (c) A decrease in the wage paid to all workers (be careful here)

5. *psquared.* The demand function for a good is $q = 100 - 2p^2$.

   (a) Find the first and second derivatives of this demand function. What are the signs of the derivatives?

   (b) Graph this demand function. Explain how your answer to part (a) affects the shape of the curve.

Answers to Review Problems:

3. *Shifters_a.*

   (a) Technology affects only supply. An improvement means more quantity supplied at a given price, hence a right shift of the supply curve. Market equilibrium price falls and quantity rises.

   (b) "Desire" reflects tastes, which affect the demand curve. Increased desire means a higher quantity demanded at any given price, hence a right shift of the demand curve. Market equilibrium price rises and quantity rises.

   (c) Since wages of *all* workers fall, we can expect two effects. First, for any particular good, demand will shift left because of lower incomes (assuming the good is a normal good). Second, the lower wage is a lower cost to firms, so supply will shift right. The market equilibrium price will definitely fall, but the effect on quantity exchanged is indeterminate.

      This type of problem is important in macroeconomics, and we will model it more completely later in the course.

4. *psquared_a.*

   (a) The derivatives are:

$$\frac{dq}{dp} = -4p < 0 \qquad \frac{d^2q}{dp^2} = -4 < 0$$

(b) The first derivative is negative so the function is downward sloping. The second derivative is also negative, so the slope is becoming more and more negative. Fortunately for us, this logic survives the backwardness of our graphing technique.: