

**Problem Set #1**  
**PAI 897**  
**Professor David Popp**  
**Fall 2023**

**Solutions Available Wednesday, September 20**

1. Use supply and demand diagrams to illustrate the effect of the following events on the market for apples. Explain briefly. ***Be sure to show how both the equilibrium price and quantity change in each case.***
  - a) Scientists find that an apple a day does keep the doctor away.
  - b) A drought shrinks the apple crop to one-third its normal size.
  - c) Congress increases the number of immigrants allowed to enter the country to work, making more workers available for apple picking.
  
2. In recent years, electric utilities have used less coal to produce electricity. Coal miners are understandably upset about this, as they have been losing jobs. Many in the industry blame these losses on increased environmental regulation. At the same time, while the use of coal to generate electricity has fallen, prices for electricity have also fallen slightly. Which of the following two explanations is more likely to explain these observations? How can you tell?
  - a) Technological advances such as hydraulic fracturing have lowered the cost of natural gas, which is a commonly used fuel to generate electricity.
  - b) Increased concerns over pollution has led governments to pass stricter environmental laws mandating that electric utilities use additional pollution control devices on power plants.
  
3. Like many universities, Great State University (GSU) has a shortage of parking places. Currently, 5,037 parking spaces for students are available on campus. To park on campus, students must purchase a parking sticker. However, at the current price of \$75, significantly more than 5,037 parking stickers were sold. As a result, many students who have parking stickers are nonetheless unable to find parking on campus.
  - a) Consider the market for parking spaces (*NOT the market for stickers, but the actual spaces!*). What does the supply curve look like? Why? Illustrate the supply curve for parking spaces.
  - b) Add a demand curve to your drawing. Currently, more stickers are sold than there are spaces available. Illustrate this scenario.
  - c) Is the market for parking spaces in equilibrium? Why or why not? If it is not, what can be done to alleviate the problem in the short run? Are there other solutions that may work in the long run but not in the short run?

4. Suppose that the market for gasoline can be represented by the following equations:

$$\text{Demand: } P = 10 - 2Q$$

$$\text{Supply: } P = 1 + 0.5Q$$

where  $P$  is the price per gallon, and  $Q$  represents quantity of gasoline, represented in millions of gallons of gasoline consumed per year.

- a) Calculate the equilibrium price and quantity of gasoline.
- b) Concerned over high prices, the government sets a price ceiling of \$2.25 per gallon of gasoline. What is the new quantity of gasoline sold in the marketplace? Use a supply and demand diagram to illustrate your answer, showing both the original equilibrium from part (a) and the new quantity sold with the price ceiling.
- c) Calculate the consumer surplus and producer surplus at the initial equilibrium price and quantity from part (a).
- d) Calculate the new consumer surplus and producer surplus with the price ceiling of \$2.25 per gallon (part b).
- e) How does the total consumer and producer surplus in part (c) compare to the total consumer and producer surplus in part (d)? What explains the difference in these two figures?