

# Problem Set 1

## Econ 3250

### 1

You own and operate a facility located in Taiwan that manufactures CPU chips used in cell phones. One year ago you acquired the land for this facility for \$2 million, and use \$3 million of your own money to finance the plant and equipment needed for manufacturing. Your facility has a maximum capacity of 10 million CPUs per year. Your cost of funds is 10% per year for either borrowing or investing. You could sell the land, plant, and equipment today for \$8 million; you estimate that the land, plant, and equipment will gain 6% in value over the coming year.

In addition to the cost of land, plant, and equipment, you incur various operating expenses associated with CPU production, such as energy, labor, raw materials, and packaging. Experience shows that these costs are \$4 per CPU, regardless of the number of chips produced during the year. In addition, producing CPUs will cause you to incur fixed costs of \$500,000 per year for items such as security, legal services, and utilities.

- a.) What is your cost function,  $C(q)$ , where  $q$  is the number of CPUs produced during the year.
- b.) Assume now that you can sell as many chips as you make at the going market price of  $p$ . What is the minimum price,  $p$ , at which you would find it profitable to produce CPUs during the coming year?
- c.) Where do you have economies of scale?

### 2

You are considering opening your own restaurant. To do so, you will have to quit your current job, which pays \$46 thousand per year, and cash in your life savings of \$200 thousand, which have been in a CD paying 6% per year. You will need this \$200 thousand to purchase equipment. You estimate that you will have to spend \$4 thousand during the year to maintain the equipment to preserve the value of \$200 thousand. You have a building suitable for the restaurant that you rent out on a monthly basis for \$2,500 per month. You anticipate that you will spend \$50 thousand for food, \$40 thousand for help, and \$14 thousand for utilities and supplies during your first year. There are no other costs involved in this business. What are the economic costs of operating the restaurant the first year? In other words, what level of revenues will you need to achieve in the first year to make the first year profitable in an economic sense?

### 3

Samsung is the only producer of phablets. The monthly demand for phablets is  $D(p) = 20400 - 100p$ . The cost of producing  $q$  phablets in a month is  $\frac{q^2}{2}$ . Hint: What does this imply for the MC of each phablet?

- a.) What is Samsung's total revenue equation?

- b.) What is Samsung's marginal revenue equation?
- c.) What is the profit maximizing number of phablets for Samsung to produce monthly? What price do they set? What is monthly profit?
- d.) Crabapple is about to enter the phablet market, what will that do to Samsung's demand? The price that is set?

#### 4

Two parts in a taillight are the plastic exterior cover and the light bulb. Which of these parts is a car company more likely to manufacture in-house? Why?