

## Chapter 5

Please answer in these same pages

### 1. Rent for GreenGene

Mr. Greengene grows corn on the land he rents from Lauren, initially at a price of \$500 per hectare. Suppose Mr. Greengene develops a new method for growing corn that decreases the growing cost by \$300 per hectare. Lauren rejoices, citing the leftover principle as she counts on collecting \$800 in rent instead of \$500.

- a. Greengene's rent will increase by \$300 per hectare if .....
- b. Greengene's rent will be unchanged if .....

### 2. Gandhi and the Leftover Principle

In 1917, Mahatma Gandhi settled a dispute between Indian farmers and British landowners. Under a share-cropping arrangement, each indigo farmer gave 15 percent of the harvest to the landowner. When landowners heard about the development of synthetic indigo, they quickly sold the land to the farmers, who at the time didn't know about synthetic indigo and the upcoming collapse of indigo prices. When the price of indigo dropped, the farmers who had purchased land demanded their money back. Gandhi negotiated a partial refund of the payments. Imagine that you are Gandhi's research assistant and must compute the appropriate refund for the typical new landowner.

- The initial price of indigo is \$10. The annual output is 100 units per hectare, and the annual nonland cost.
  - To purchase land, farmers borrow money at an interest rate of 10 percent per year.
  - The alternative crop is rice, which has a price of \$8, an annual output of 100 units and a nonland cost (including the opportunity cost of the farmer).
- a. Under the original share-cropping arrangement, the effective annual rent on land is \_\_\_ per hectare, computed as ....  
This implies that the nonland cost per hectare is \_\_\_ computed as .....
  - b. Before farmers find out about synthetic indigo (while they are assuming that the price will be \$10) the annual profit from indigo is \_\_\_ per hectare, computed as ....  
A farmer's willingness to pay for a hectare of land is \_\_\_, computed as .....
  - c. Suppose that the development of synthetic indigo decreases the price of indigo to \$5. The new annual profit from a hectare of land is \_\_\_, computed as ....
  - d. A farmer's willingness to pay is \_\_\_ per hectare. The appropriate refund, to be paid by the old landowners to the new landowners is \$500 computed as .....

### 3. Compute the Manufacturing Bid Rent

Consider a manufacturing firm that occupies two hectares of land. The firm produces 10 tons of output per day and sells its output at a price of \$80 per ton. The firm does not engage in factor substitution as the price of land changes. Intraurban transportation is on trucks, with a unit cost of \$12 per ton per mile. The firm's nonland cost is \$200 per day. The firm exports its output via circumferential highway (beltway).

a. Draw the firm's bid-rent curve for land for different distances from the beltway, from a distance of zero to five miles.

b. The bid rent at the beltway is \_\_\_ per hectare and the slope of the bid-rent curve is \_\_\_ per mile, computed as ....

### 4. Housing price curve.

The Housing price curve tends to be convex when we introduce in the model the following assumption:

- A perfectly inelastic demand for housing
- A steady utility for housing surface
- Consumer substitution
- All of the above.

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### 5. Benefits from Street Improvements

Suppose a city widens the streets in an industrial area, thus improving the access of trucks to an interstate highway.

a. In the long run, the bulk of the benefits of the street improvements go to [landowners, workers, trucking firms, manufacturing firms] because .....

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b. Illustrate with a graph.

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### 6. Opportunity Cost and Office Bid-Rent Curve

Using Table 6-4 and Figure 6-3 as a starting point, suppose the opportunity cost of travel by office workers increases by 25 percent.

- a. At a distance of 5 blocks, travel cost = \_\_\_\_; the willingness to pay for land = \_\_\_\_; the bid rent per hectare = \_\_\_\_
- b. Draw the old and the new bid-rent curves for the office sector.

- c. The new bid-rent curve is steeper, and reaches a value of zero at  $x = \underline{\hspace{1cm}}$ .

← - - - - Con formato: Justificado

### 7. Segway for Information Workers

The Segway Human Transporter is a self-balancing personal transportation vehicle that is clean (battery powered) and small (its footprint is 19 by 25 inches) so it can be used on sidewalks and inside building. Suppose the Segway is introduced into a CBD, doubling the speed of travel for information exchange.

- a. Show the effects of the Segway on the bid-rent curve for the office sector in two circumstances:

- Fixed building heights: Office firms do not engage in factor substitution. The gap between the old bid-rent curve and the new bid-rent curve [increases, decreases] as distance increases.
- Variable building heights.

- b. In the long run, the bulk of the benefits of the Segway go to [office firms, office workers, landowners].

### 8. Housing Price and Land Bid-Rent Numbers

Consider a monocentric city where the cost of commuting is \$40 per mile per month. A household located eight miles from the city center occupies a dwelling with 1,000 square feet at a monthly rent of \$600. Nonland cost per dwelling is \$250, and there are 10 houses per hectare.

- a. The price (per square foot) of housing at a distance of 8 miles is \_\_\_\_ per square foot, computed as .....
- b. The bid rent for land at a distance of 8 miles is \_\_\_\_ per hectare, computed as .....

- c. Assume that the demand for housing is perfectly inelastic. The price (per square foot) of housing at a distance of 5 miles is \_\_\_ per square foot, computed as ...
- d. Assume that housing firms do not engage in factor substitution. The bid rent for land at a distance of 5 miles is \_\_\_ per hectare, computed as ....
- e. Suppose consumers engage in consumer substitution and firms engage in factor substitution. The bid-rent for land at a distance of 5 miles would be [greater, less] than the number computed in part (d) because ...

### 9. Violating the Law of Demand

Consider a region with two cities: Obeyburg (B) and Vioville (V). The cities differ in the individual demand curves for housing. Consumers in Obeyburg obey the law of demand, with negatively sloped individual demand curves.

Consumer in Vioville violate the law of demand, with positively sloped individual demand curves. Draw and explain the housing-price curves for the two cities (labeled  $P_B$  for Obeyburg and  $P_V$  for Vioville) under the assumption that  $P_B = P_V$  at a distance for five miles from the city center. Hint: How does conventional consumer substitution affect the shape of the housing-price curve, and how would contrary consumer substitution affect the shape?

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### 10. Crime and Housing Prices

Consider a city where everyone commutes to the city center, and commuting cost per mile per month is \$40. Each household occupies a 1,000-square-foot dwelling and has \$7,000 worth of possessions in its dwelling. The probability that any particular household will be burglarized and lose all its possessions (to 0.09 at insurance) is 0.10 at the city center and decreases by 0.01 per mile (to 0.009 at one mile, 0.08 at two miles, and so on). The price of housing is \$1.00 per square foot at the city center.

- a. Starting from the center, one-mile move outward changes the expected value of the loss from crime from \_\_\_ to \_\_\_ a change of \_\_\_ per square foot.
- b. The slope of the housing-price curve is \_\_\_ computed as ....
- c. The curve is positively sloped and linear, with a slope of \$0.03 per mile. The price changes from \_\_\_ at the city center to \_\_\_ five miles away.

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