1. 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 buildings. Suppose the vehicle is introduced into a CBD, doubling the speed of travel for information exchange. Depict graphically the effects on the bid-rent curve for the office sector in two circumstances:

Segway will decrease travel costs which will decrease bid rents (p. 110)

A. fixed building heights: Office firms do not engage in factor substitution

![Graph showing bid-rent curve for fixed building heights.]

B. Variable building heights.

![Graph showing bid-rent curve for variable building heights.]

C. Who benefits from the innovation?

Those farther away from CBD as travel costs decline, area w/o factor substitution benefits

2. Consider an office firm with the following characteristics: the wage of executives is $120 per hour, and the executive takes 4 minutes to walk one block (eight minutes roundtrip); the price of output is $150, and the firm produces 50 consultations (requiring 50 trips to the city center); at a location four blocks from the city center, the firm occupies a one-acre site and spends $1,000 on nonland inputs.

A. What is the travel cost per block?

$16 per block roundtrip

B. How much is the firm willing to pay for land four blocks away from the city center?

Rent = (TR – K Cost – Other Prod Costs – Travel Costs) / Lot Size (pp 106)
Rent = (($150*50) - $1000 - ($16*50*4))/1 acre = $3300/acre

C. Given the available information, is it possible to compute how much the firm is willing to pay for land one block from the city center? If not, what additional information is needed?

Possibly? K costs unknown (bldg height)
3. Suppose a city restricts the heights of its residential structures. The maximum building height is four stories, the height that would normally occur at a distance of five miles from the city center.

A. Draw two residential bid-rent functions, one for the city in the absence of height restrictions and one with height restrictions. Clearly label your graphs for each situation.

![Graph](image)

B. Discuss the effects of the height restrictions on i) wages, ii) total employment, and iii) land rent in the CBD.
   i) wages decline
   ii) total employment increases
   iii) land rent in CBD declines

4. According to Ms. Wizard, “The large, traditional monocentric city of the 19th century was a fluke, a result of a particular sequence of technological transportation innovations over the 19th and 20th centuries. If the sequence of innovations had been slightly different, the large monocentric city never would have developed. Instead, we would have gone directly from the small cities of the 18th century to the large, multicentric suburbanized cities that we see today.”

A. List the sequence of innovations that caused the rise and then demise of the large monocentric city.
   RISE
   1. Intracity Transport (omnibus, cable cars, electric trolley, subway)
   2. Bldg Construction (balloon frame, manufactured nails, steel frames, elevator)
   3. Technology of Freight (horse-drawn wagon, trucks/cars)
   DEMISE
   1. Trucks and highways
   2. suburbanization of Mfg/decentralization of office employment

B. List an alternative sequence under which the monocentric city would not have developed.
   No bldg tech for taller bldgs, auto/truck for decentralized transport
Nongraded Portion
Consider the building-permit policy depicted by Figure 9-5 of your textbook. Suppose that the city announces on January 1 that 300 days later (October 28th) it will give the 80 permits to the first 80 building contractors through the planning office door. The police chief announces the following queuing rules:

i. No Cuts: When a person joins the queue, s/he goes to the end of the queue.
ii. No Substitutions: No one can reserve a place in line for anyone else.

To receive a permit, a licensed contractor must be one of the first 80 people in line and must remain in the line until October 28th. Therefore, instead of an equilibrium price for permits, there is an equilibrium waiting time (time spent in line). Suppose that 30 of the city’s 120 licensed contractors have an opportunity cost of $300 per day, 30 have an opportunity cost of $500 per day, 30 have an opportunity cost of $1,000 per day, and 30 have an opportunity cost of $2,000 per day.

A. What is the equilibrium waiting time? Illustrate with a graph showing the vertical supply of permits and the demand curve for permits, with the price measured as days spent in line.

B. Suppose the city eliminates the no-substitution rule. Would you expect the equilibrium waiting time to increase, decrease, or not change at all?