1. (5 marks) Assume the voters in Kitchener-Waterloo (KW) all have one-dimensional political views that can be arrayed on a left-right spectrum. The citizen with the most extreme left-wing views is said to be at point 0 and the citizen with the most extreme right-wing views is said to be at point 2. The density function for political views is an isosceles triangle with a base of 2 and a height of 1. Next November voters will decide between two candidates, A and B. The election rules require that A and B state where they stand on the political spectrum and once they have chosen a position they cannot deviate from it. A coin was flipped and candidate A must state her position by October 20th. Candidate B has until October 30th to state her position. Voters always vote for the candidate whose stated position is nearest to their own views. (If there is a tie for nearest candidate, voters flip a coin to decide which to vote for.) Is there an equilibrium in this setting? If so, what is it? Defend your answer carefully.

ANSWER

Look at Figure 1 on the second to last page. The density function is symmetric about point 1. If A chooses any position to the left of 1, say point $a$, B will choose a point between $a$ and 1, and win for sure. If A chooses any position to the right of 1, say point $a'$, B will choose a point between 1 and $a'$, and win for sure. Thus the only sensible position for A is to choose point 1. Given that A has already chosen point 1, B loses for sure unless B chooses point 1. Thus they both choose point 1 and each will win with probability $1/2$ (the coin flip). This is an example of the “median voter model” — under certain conditions, all candidates target the median voter.

2. Suppose a “town” comprises people uniformly distributed along a line 30 miles long, with 100 people per mile. Travel costs are 1 dollar per person per mile. There is one bowling
alley located at mile 10 and another located at mile 20. All customers are willing to pay up to 15 dollars for a night of bowling. The mile-10 bowling alley is a little newer — the marginal cost of caring for a customer while at that bowling alley is 2 dollars. The marginal cost of caring for a customer at the mile-20 bowling alley is 4. Ignore the fixed costs of each bowling alley — set them equal to zero.

(a) (2 marks) Assume customers pay their own transport costs to the bowling alley and each bowling alley acts to maximize its profits. Calculate total consumers’ surplus and the total profits of the two bowling alleys.

(b) (3 marks) Now assume the bowling alleys pay transport costs for their customers, and again, each bowling alley acts to maximize its profits. As carefully as you can, draw: (i) a graph of price against location; (ii) a graph of profit against location; and (iii) a graph of consumer’s surplus against location.

(c) (2 marks) What does “price discrimination” mean in this context?

**Answer**

(a) Looking at the equivalent question on assignment 3 we see that in part (a) of that question MR for each bowling alley is discontinuous at \( Q = 1000 \) — it drops from 5 to negative numbers for \( Q > 1000 \). So here where MC is 2 for the bowling alley at mile 10 and 4 for the alley at mile 20, the profit-maximizing output will not change for either alley. Profits for the alley at mile 10 rise to 8000 dollars, profits for the alley at mile 20 fall to 6000 dollars, and total profits are unchanged at 14000 dollars. Since price hasn’t changed total consumers’ surplus is still 5000 dollars.

(b) As on assignment 3, if the bowling alleys are paying the transport costs then the bowling alleys know where people live. If the alleys could charge everyone 15 dollars for a night of bowling they would. But they can’t. Think of the person at mile 16. The cost to the alley at mile 10 is a cost at the alley of 2 dollars plus a transport cost of 6 dollars. The costs to the alley at mile 20 of looking after this person are the cost at the alley of 4 dollars plus a transport cost of 4 dollars for a total cost of 8 dollars. So the person at mile 16 is the person that separates the markets for the two bowling alleys. Figure 2 (i) shows the graph of price against location. Moving away from mile 16 in either direction, price rises at the transport-cost rate of a dollar per mile until it reaches 15 dollars. Figures 2 (ii) and (iii) follow from the price graph, the costs for each alley and 15 dollars that each customer is willing to pay for a night of bowling.

(c) “Price discrimination” may mean charging different people different prices for the same good or service — like two people sitting in equivalent seats on a plane who pay different prices. But “price discrimination” may also occur when two people pay the same price but the marginal cost to the supplier is different for the two people. Above, there are many examples of two people paying the same price of 15 dollars for a night of bowling but the costs to the bowling alley for each differ. “Price discrimination” occurs when price divided by marginal cost differs across customers.