1. Which of the three urban definitions used by the Census Bureau (urbanized area, urban place, metropolitan area) is closest to the economist’s definition of a city? Explain your reasoning.

10 points

Urban Area = density + economic activities that require population concentration

2. The table below summarizes the productivity of workers in wheat and cloth production in two parts of a region. 30 points total

<table>
<thead>
<tr>
<th>Output per Labor Hour</th>
<th>Opportunity Cost of Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>East</td>
</tr>
<tr>
<td>Wheat</td>
<td>1</td>
</tr>
<tr>
<td>Cloth</td>
<td>1</td>
</tr>
</tbody>
</table>

A. Complete the table by providing the opportunity costs of producing wheat and cloth in the East and West.
5 points

B. Assume the transport costs are zero and that the exchange rate is two bushels of wheat for one yard of cloth. If a western household switches one hour from cloth production to wheat production and exchanges half of its additional wheat for cloth, will the household be better off? Explain why.
10 points

W:C = 2:1 exchange

<table>
<thead>
<tr>
<th>Labor Change</th>
<th>E_W</th>
<th>E_C</th>
<th>W_W</th>
<th>W_C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange</td>
<td>+6</td>
<td>-3</td>
<td>-6</td>
<td>+3</td>
</tr>
<tr>
<td>Net</td>
<td>+6</td>
<td>-3</td>
<td>+6</td>
<td>0</td>
</tr>
</tbody>
</table>

C. Suppose that the time required to execute the trade in B is two thirds of an hour. Is trade still beneficial? At what transaction cost (time per trade) would the net gain from trade be zero?
5 points

40 minutes = 8 wheat
8 > 6 so gains erased
min transaction cost = ½ hour

D. Under what conditions will the differences in labor productivity cause the development of cities?
10 points

comparative advantage combined with trading firms, lower transaction costs
3. Consider a 10-firm industry that produces computer equipment, a set of goods with rapidly changing demand and production technology. The industry has the following characteristics:
   i. The 10 firms produce computer equipment using labor and raw materials.
   ii. Raw materials are ubiquitous (available at all locations at the same price).
   iii. Each firm produces one new product per year, and each product becomes obsolete after a year.
   iv. Only 3 of the 10 new products will be successful (sell more than a trivial amount).
   v. The monetary and time costs of switching a worker from one firm to another are zero, regardless of the spatial distribution of firms.

A. Will the firms in the industry form a cluster? Why or why not?
   10 points
   No, they will not form a cluster. Uniform distribution of raw materials (ii) implies no cost advantages to clustering while iii implies no historical legacy from year to year. The 30% success rate (iv) implies no knowledge spillovers across firms.

B. How would your answer to A change if workers incur moving costs when they switch from one firm to another?
   10 points
   Yes, firms would cluster now because moving costs will create a labor pool for firms to share.

4. Suppose the outputs of beauty shops and pet-grooming salons are complementary, providing one-stop shopping for personal and pet maintenance. Betty Beehive is thinking about moving her beauty shop from an isolated location to a vacant building next to Peter’s pet grooming shop. In making her decision, she makes the following assumptions:
   i. If Betty moves, she will keep all her current customers (20 people per week) and attract 25% of Peter’s current customers.
   ii. Peter currently has 60 customers per week.
   iii. Excluding rent, Betty’s profit per beauty treatment is $10.
   iv. The weekly rent at the new location is $200 higher than Betty’s current rent.

A. If Betty moves her beauty shop, will her profits increase or decrease? By how much?
   12.5 points
   Betty’s profit will decrease by $50 per week (original profit = $200, new profit = $150 = $350 - $200 rent differential)

B. Suppose that if Betty makes the move, 50% of her original customers will switch from George’s grooming salon to Peter’s. If Peter’s profit per treatment is $8, how much would he be willing to pay Betty to make her move? Will the payment be enough to induce Betty to make the move?
   12.5 points
   Peter will pay up to $80 for Betty’s move (10 * $8). Yes, this will induce Betty to move (now she has $30 more profit at the new location than at her original one).
5. Consider a region that initially has 12 identical cities, each with a workforce of 1 million (the optimum or utility-maximizing workforce). Suppose that commuting by automobile is replaced by commuting by jet pack (strap it on and fly to work), and the time and monetary costs of commuting decrease. The optimum workforce trips to 3 million. 15 points total

A. Depict graphically the effects of jet packs on the urban utility curve.

5 points
Utility/worker

![Diagram showing utility curve with points A, B, and C.]

Given initially at optimum (B), jet packs will move from B to C on utility curve as # workers/city increases from 1 to 3 million as commuting costs decrease.

B. Is the initial workforce of 1 million an equilibrium? Is it a stable equilibrium?

5 points
Yes, the initial workforce is an equilibrium. It is stable because a move in either direction leads to a decrease in utility/worker.

C. Predict the new equilibrium workforce and number of cities.

5 points
New equilibrium workforce = 3 million
Number of cities = 4 = 12 million / 3 million

Non-graded Question (Chapter 5):
1. In a report in September 1989, a consulting firm estimated the economic impacts of moving the Los Angeles Raiders (a professional football team) to Sacramento. The economic base study was based on the following assumptions:
   i. Total attendance at the Raider games will be 700,000 people per year.
   ii. The average ticket price will be $30.
   iii. The average fan will spend $10 on food, merchandise, and parking.
   iv. Based on ii and iii, the average fan will spend a total of $40.
   v. Total “direct” spending will be $28 million per year ($40 x 700,000).

Using the spending multiplier of 2.2, the consulting firm estimated the total economic impact of the Raiders to be $61.6 million per year. Critically appraise the methods used to compute the total economic impact of the Raiders.