EC1410-Spring 2026
Problem Set 5

(Updated 12 December 2025)

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When you write up your answers, your goals should be to (1) be correct, and (2) convince your reader that your answer is correct. It is always helpful if your work is legible and if all steps are presented, possibly with a line of explanation. Answers that do not achieve these goals will not be awarded full credit. 100 points are possible. Points for each problem given in parentheses.

Problems

1. In this question we will examine the dissimilarity index of a fictional city.

   Assume there are three census tracts in a city, each with population 1. Assume that, initially, the black population of the city is zero. At the end of the period, the black population increases to $\frac{1}{7}$ of the total city population (i.e., the city is around 14% black), while the non-black population does not change. Answer the following questions about the population distribution at the end of the period.

   (a) (5) What is the total city population and black population?

   (b) (10) Assume that the black population is equally divided among the three tracts. What is the dissimilarity index?

   (c) (10) Assume that the entire black population is in one census tract. What is the dissimilarity index in this case?

   (d) (10) Given the above, how should we interpret the rapid increase in the time series of the dissimilarity index in Figure 1 of Cutler et al. (1999)?

   (e) (5) Why is it important that the empirical analysis in Cutler et al. (1999) focuses on the variation in the dissimilarity index across cities, instead of over time?

2. (10) How much lower is the black than non-black college graduation rate in 1990 in high segregation cities compared to low segregation cities?

3. In this problem, we will examine bid-rent functions with two types of agents.

   Assume there are two types of agents, the rich and the poor, whose only difference (for now) is their wage levels, with $w_r > w_p$. Assume also that everyone takes the bus, which has cost

   $$(w_r * t^b + c^b)|x| \text{ for the rich type, where } t^b, c^b > 0$$
   $$(w_p * t^b + c^b)|x| \text{ for the poor type, where } t^b, c^b > 0$$

   (a) (10) Set up the household problem from the monocentric city model for each type of agent.

   (b) (10) Assume $u(c^*) = \overline{u}$ for both types. For both types, substitute an expression for c^* in terms of $\overline{u}$ into the constraint from the previous part. Call these functions $R_r(x)$ and $R_p(x)$, respectively.

(c) (10) Evaluate $R_r(0)$ and $R_p(0)$. Which is larger?

(d) (10) Evaluate $\frac{\partial R_r(x)}{\partial x}$ and $\frac{\partial R_p(x)}{\partial x}$. Which is steeper?

(e) (10) Plot $R_r(x)$ and $R_p(x)$ on one graph. Indicate the areas in which each type has the higher willingness to pay. Describe the resulting equilibrium briefly.