Instructions:
There are 4 questions worth a total of 100 points. Answer each question clearly and concisely. You must show your work to receive credit. You are allowed to work with others, but all work must be your own.

Clearly print your name above and in the space provided on the next page. You must turn in both sides of this cover sheet along with your responses. You do not need to turn in the questions, only your responses with the cover sheet. All pages must be stapled to be graded.
Name: ________________________________

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Product Differentiation

1. Consider a linear city Hotelling model. There are two firms, A and B, located at the ends of the product space. The length of the product space is 3 and transportation costs are 1 times the distance traveled. Each consumer has a baseline valuation of 9 and each firm has a constant marginal cost of 4. The indirect utility function for each consumer is $u_A(x) = 9 - p_A - 1(x)$ and $u_B(x) = 9 - p_B - 1(3 - x)$ depending on whether you buy from firm A or firm B. Answer the following questions for the competitive equilibrium if it exists.

(a) What is each firm’s best response function?

(b) Are the two goods strategic complements or strategic substitutes?

(c) What are the equilibrium prices and quantities?

(d) Find the profits of each firm and represent profits graphically in the preference space.

(e) Find the consumer surplus and represent this measure graphically in the preference space.

2. How do profits change as the length of the product space increases for any horizontal product differentiation model? This includes both the Hotelling linear city model and the Salop circle model.

3. Consider a Salop circular model of product differentiation with one firm. The circumference of the circle is 6. Each consumer has transportation costs of 1 times the distance traveled and a baseline valuation of 9. The firm has a constant marginal cost of 4. The indirect utility function for each consumer is $u_A(x) = 9 - p_A - 1(x)$.

(a) Find the equilibrium price and quantity.

(b) Find the profits of the firm and represent profits graphically in the preference space.

(c) Find the consumer surplus and represent this measure graphically in the preference space.

(d) How does this model compare to the Hotelling model?
4. Consider a Salop circular model of product differentiation with two equally spaced firms. The circumference of the circle is 6. Each consumer has transportation costs of 1 times the distance traveled and a baseline valuation of 9. Both firms have a constant marginal cost of 4. The indirect utility function for each consumer is $u_A(x) = 9 - p_A - 1(x)$ and $u_B(x) = 9 - p_B - 1(3 - x)$ depending on whether you buy from firm A or firm B. Answer the following questions for the competitive equilibrium if it exists.

(a) What is each firm’s best response function?

(b) Are the two goods strategic substitutes or strategic complements?

(c) Find the equilibrium prices and quantities.

(d) Find the profits of each firm and represent profits graphically in the preference space.

(e) Find the consumer surplus and represent this measure graphically in the preference space.

(f) How does this model compare to the Hotelling model?

(g) How does this model compare to the monopoly version of the Salop circular model?