Instructions:
You must answer exactly 4 of the following 5 questions. Be sure to clearly indicate which questions you are answering. Each question is worth the same amount. You have the class period to complete the exam.

Answer each question clearly and concisely. You must show your work to receive credit.
This exam is given under the rules of the Montana State University. You may not use notes or receive any assistance. There is to be no talking during the exam.
Clearly print your name on your blue book. You must turn in your blue book(s) You do not need to turn in the questions, only your blue book(s).
1. Consider a linear city Hotelling model. There are at most two firms, A and B, located at the ends of the product space. The length of the product space is 5 and transportation costs are 1 times the distance traveled. Each consumer has a baseline valuation of 10 and each firm has a constant marginal cost of 2.

(a) If Firm A is a monopolist and located to the very left of the product space, characterize the indifferent consumer.

(b) If Firm A is a monopolist and located to the very left of the product space, what is the equilibrium price, quantity and profit?

(c) If Firm B enters the market and is located to the very right of the product space, what is the new competitive equilibrium price?

(d) Compare the monopoly outcome to the duopoly outcome.

2. 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. Answer the following questions for the competitive equilibrium if it exists.

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

(b) Find the equilibrium prices and quantities.

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

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

3. The inverse demand function is \( P = 120 - 2Q \). Two firms compete in quantities and each firm has a cost of \( C(q_i) = 2q_i^2 \). The interest rate is 25%.

(a) If a competitive equilibrium is maintained over time, what is the discounted sum of profits?

(b) If firms can perfectly collude and share the profits evenly, what would be the per period profits of each firm?

(c) Consider a trigger strategy where if a firm deviates from a collusive equilibrium, the other firm behaves competitively forever after. What is the discounted sum of profits obtained by deviating from a collusive equilibrium and is it possible to maintain a collusive equilibrium if the other firm plays the trigger strategy?

(d) Consider another type of trigger strategy where one firm tries to establish a collusive equilibrium from the competitive equilibrium. If one firm deviates from the competitive quantity to the collusive quantity, then the other firm will play along forever after (unless one firm deviates from the collusive equilibrium). What is the discounted sum of profits obtained by deviating from a competitive equilibrium and is it possible to switch from a competitive equilibrium to a collusive one?
4. Answer the following questions:

(a) What is a factor that influences the expected punishment received from the formation of a cartel?
(b) What are some pricing practices that facilitate non-cooperative collusion?
(c) Why don’t anti-trust authorities ban the specific pricing practices you mentioned in part b?
(d) How does the size and frequency of transactions influence cartel stability?

5. The inverse market demand is \( P = 120 - 2Q \), costs for Firm \( i \) are \( C(q_i) = 20q_i \) and there are four firms.

(a) What is the competitive equilibrium price and the profit of each firm?
(b) If all firms perfectly collude, what is the collusive equilibrium price and the profit of each firm?
(c) Assume the four firms perfectly collude. A policy maker asks you to come up with a reason why they should do something about collusion and support your explanation with numerical evidence from this problem. How do you respond?
(d) Another policy maker argues that all policy makers have perfect information/foresight and that they have the ability to construct optimal transfers. Why might policy makers still want to do something about collusion and support your explanation with numerical evidence from this problem?