Instructions:
There are 8 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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Model Comparison

1. Given an inverse demand function of $P = 120 - 2Q$ and costs for Firm $i$ of $C(q_i) = 20q_i$, find the perfectly competitive equilibrium:
   (a) Market Quantity (1)
   (b) Price (1)
   (c) Consumer Surplus (2)
   (d) Deadweight Loss (2)
   (e) If the fixed cost is $10, what is the profit of a single price taking firm? (2)

2. Given an inverse demand function of $P = 120 - 2Q$ and costs for Firm $i$ of $C(q_i) = 20q_i$, find the monopoly equilibrium:
   (a) Quantity (1)
   (b) Price (1)
   (c) Consumer Surplus (2)
   (d) Profit (2)
   (e) Deadweight Loss (2)

3. Given an inverse demand function of $P = 120 - 2Q$ and costs for Firm $i$ of $C(q_i) = 20q_i$, find the Cournot duopoly equilibrium:
   (a) Firm Quantity (2)
   (b) Market Quantity (2)
   (c) Price (2)
   (d) Consumer Surplus (2)
   (e) Firm Profits (2)
   (f) Deadweight Loss (2)
   (g) Lerner Index (2)
   (h) HHI (2)
   (i) What is each firm’s best response function? (2)
   (j) Plot the best response functions in the strategy space. (2)
4. Given an inverse demand function of \( P = 120 - 2Q \) and costs for Firm \( i \) of \( C(q_i) = 20q_i \), find the \( N \) firm symmetric Cournot equilibrium:
   - (a) Firm Quantity
   - (b) Market Quantity
   - (c) Price
   - (d) Consumer Surplus
   - (e) Firm Profits
   - (f) Deadweight Loss
   - (g) Lerner Index
   - (h) HHI

5. Given an inverse demand function of \( P = 120 - 2Q \) and costs for Firm \( i \) of \( C(q_i) = 20q_i \), find the duopoly Bertrand equilibrium:
   - (a) Firm Quantity
   - (b) Market Quantity
   - (c) Price
   - (d) Consumer Surplus
   - (e) Firm Profits
   - (f) Deadweight Loss
   - (g) Lerner Index
   - (h) HHI
   - (i) What is each firm’s best response function?
   - (j) Plot the best response functions in the strategy space.

6. Compare the results from Questions 1-5:
   - (a) How does the deadweight loss change across the models?
   - (b) How does the Lerner Index change across the models?
   - (c) How are the duopoly Cournot and Bertrand best response functions different?
Cournot Model with Asymmetric Costs

7. The inverse demand function is \( P = 120 - 2Q \), the costs for Firm 1 are \( C(q_1) = 12q_1 \) and the costs for Firm 2 are \( C(q_2) = c_2q_2 \) where \( c_2 \geq 0 \) is a parameter. Assume firms compete in quantities.

(a) Find the best response functions for each firm.

(b) Find the equilibrium quantities for each firm as a function of \( c_2 \).

(c) Comparative Statics: Find \( \frac{dq_i^*}{dc_2} \) for \( i = 1, 2 \).

(d) Describes what happens to \( q_1^* \) and \( q_2^* \) as \( c_2 \) increases.

(e) What happens to the market quantity as \( c_2 \) increases.

(f) Is there a value of \( c_2 \) such that \( q_2^* = 0 \)? If so, what is this value. If not, why?

8. The inverse demand function is \( P = 120 - 2Q \), the costs for Firm 1 are \( C(q_1) = 12q_1 \) and the costs for Firm 2 are \( C(q_2) = 18q_2 \). Assume firms compete in quantities.

(a) Find the best response functions for each firm.

(b) Find the equilibrium quantities for each firm.

(c) What is the equilibrium price?

(d) Find the consumers surplus.

(e) What are each firm’s profits?