Homework Set 4

Due 6/7/24

Reminder: **No grace period,** 6/7 at 11:59pm is the absolute due date.

Question 1

Suppose that two firms are competing in a Cournot-style duopoly. The firm's profits are given by

$$\pi_1(q_1, q_2) = \left(150 - \frac{1}{4}q_1 - \frac{1}{4}q_2\right)q_1 - \left(\frac{5}{4}q_1^2 + 75\right)$$

$$\pi_2(q_1, q_2) = \left(150 - \frac{1}{4}q_1 - \frac{1}{4}q_2\right)q_2 - (25q_2 + 150)$$

Find the best response function for each firm.

Question 2

Suppose that two firms are competing in a Cournot-style duopoly, where market demand follows

$$4Q + 2P = 480$$

The firms' cost functions are given by

$$c_1(q_1) = 2q_1^2$$
$$c_2(q_2) = 16q_2$$

(a)

Write down the profit function for each firm.

(b)
Derive the best response function for each firm.

(c)
Find the Nash Equilibrium of this Cournot game.

(d)
Compute equilibrium profits for each firm.

Question 3

For each of the following games, find <u>all</u> Nash Equilibrium.

(a)

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Gonzo

		Roma	Vero
	Roma	5, 3	1, 1
Alfonso	Vero	0, 0	3, 5

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(b)

<div align="center">

Eleanor

		Milk	Eggs
	Hennessy	0, 0	−1, 1
Janet	Celsius	2, −2	−5, −4

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Question 4

For the following game, assume player 2 is playing $\tau(q) = qN + (1-q)M$

<div align="center">

Sitter

	Nice	Mean
Scream	$1, -2$	$2, -3$
Cry	$4, -3$	$3, -1$
Whine	$2, -3$	$3, -4$
Flee	$1, -4$	$4, -2$

Babe' (row player labels: Scream, Cry, Whine, Flee)

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(a)

Graph the payoff that player 1 receives from playing each of their pure strategies in response to τ.

(b)

Using your graph from (a), write down $BR_1(q)$. Are any of player 1's strategies non-rationalizable?