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**Commitment and Information in Games**

Problem Set 2  
**(Dominance)**

Name: \_\_\_\_\_

2.1 Which strategies in the following normal-form game survive the iterated deletion of strictly dominated strategies? For every step of elimination, state explicitly which strategies are strictly dominated by which strategies.

|          |          |          |          |
|----------|----------|----------|----------|
|          | <b>A</b> | <b>B</b> | <b>C</b> |
| <b>a</b> | 2, 0     | 1, 1     | 4, 2     |
| <b>b</b> | 3, 4     | 1, 2     | 2, 3     |
| <b>c</b> | 1, 3     | 0, 2     | 3, 0     |

|          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|
|          | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> | <b>E</b> | <b>F</b> |
| <b>a</b> | 0, 10    | 0, 10    | 0, 10    | 0, 10    | 0, 10    | 0, 10    |
| <b>b</b> | 8, 2     | 2, 8     | 2, 8     | 2, 8     | 2, 8     | 2, 8     |
| <b>c</b> | 8, 2     | 5, 5     | 4, 6     | 4, 6     | 4, 6     | 6, 4     |
| <b>d</b> | 8, 2     | 5, 5     | 3, 7     | 6, 4     | 6, 4     | 6, 4     |
| <b>e</b> | 8, 2     | 5, 5     | 3, 7     | 1, 9     | 8, 2     | 6, 4     |
| <b>f</b> | 8, 2     | 4, 9     | 3, 7     | 1, 9     | 1, 9     | 3, 7     |

2.2 How often do you have to use the phrase “every player knows” when motivating the solutions of question 2.1 with the rationale

*“No player uses strictly dominated strategies; and every player knows that no player uses strictly dominated strategies; and every player knows that every player knows that no player uses...” “?”*

- 2.3 **(Beauty Contest)** Two agents play the following game: Each player privately writes a positive integer between zero and one hundred ( $s_1, s_2 \in \{0, 1, \dots, 99, 100\}$ ) on a sheet of paper. An impartial arbitrator collects the sheets and computes the arithmetic mean of the chosen numbers,  $z = (s_1 + s_2)/2$ . The player whose number is closest to half of the mean ( $z/2$ ) wins. Are there strictly dominant strategies in this game? Are there any strictly dominated strategies? Solve the game by iterated deletion of strictly dominated strategies.

2.4 **(Cournot Competition)** In a homogeneous products market with inverse demand given by  $P(x) = \max\{1-x, 0\}$  two firms ( $i = 1, 2$ ) compete by simultaneously choosing output quantities  $s_1$  and  $s_2$  (where  $x = s_1 + s_2$ ). Both firms have the same cost function  $C(s_i) = s_i/10$ . Assume that the competitors can choose only between quantities of 0.225, 0.3 and 0.45 ( $s_1, s_2 \in \{0.225, 0.3, 0.45\}$ ). Represent this situation as a game in normal-form and solve it by iterated deletion of strictly dominated strategies. Use eight-hundredth fractions for displaying payoffs, for example write  $81/800$  instead of  $0.10125$ .

2.5 **(Pure Strategies Dominated by Mixed Strategies)** Consider the following normal-form game:

|          | <b>L</b> | <b>R</b> |
|----------|----------|----------|
| <b>U</b> | 7, 0     | 3, 1     |
| <b>M</b> | 4, 4     | 5, 2     |
| <b>D</b> | 3, 3     | 8, 2     |

Is any of the pure strategies of one of the players strictly dominated by a mixed strategy? If so, specify which pure strategy is strictly dominated by which mixed strategy (or strategies).