1. Consider the game matrix below for two players, and the mixed strategy profile s1 : (0.3, 0.1, 0.6) and s2 : (0.5, 0.5, 0) where s1 is the strategy for the row player and s2 is the strategy for the column player.
   1. Calculate the expected payoff for each player when the players play the strategy profile (s1, s2).
   2. Now, calculate the expected value of playing each of the row players *pure* strategies against the column players strategy s2.
   3. What is the best response for the row player to s2?

|  |  |  |  |
| --- | --- | --- | --- |
|  | D | E | F |
| A | 0, 3 | 4, 2 | 2, 3 |
| B | 1, 4 | 2, 1 | 5, 2 |
| C | 2, 3 | 2, 1 | 4, 0 |

1. E(S1) = 0.3\*(0+2+4) + 0.1\*(8) + 0.6\*(8) => 0.7\*(8) + 0.3(6) => 5.4+1.8 => 7.2

E(S2) = 0.5(10) + 0.5(4) +0(…) = 5+2= 7

B) ExpectedValue(A) = (0.5\*0 + 0.5\*4 + 0\*2) => 2

ExpectedValue(B) = (0.5\*1 + 0.5\*2 +0\*5) => 1.5

ExpectedValue(C) = (0.5\*2 +0.5\*2+0\*4) => 2

C) Best response is to choose A) or C)

1. For each of the games below, list the set of Pareto-optimal outcomes.

|  |  |  |
| --- | --- | --- |
|  | C | D |
| A | 3, 3 | 1, 3 |
| B | 4, 0 | 3, 2 |

|  |  |  |
| --- | --- | --- |
|  | C | D |
| A | 1, 3 | 3, 0 |
| B | 2, 0 | 1, 1 |

3) Find all pure-strategy Nash equilibria of the games below.



|  |  |  |  |
| --- | --- | --- | --- |
|  | D | E | F |
| A | 0, 3 | 4, 2 | 2, 3 |
| B | 1, 4 | 2, 1 | 5, 2 |
| C | 2, 3 | 2, 1 | 4, 0 |

|  |  |  |  |
| --- | --- | --- | --- |
|  | D | E | F |
| A | 3, 2 | 1, 4 | 2, 2 |
| B | 5, 0 | 4, 3 | 3, 1 |
| C | 4, 3 | 0, 2 | 3, 3 |

4) Find all pure and mixed strategy equilibria of the games below.



|  |  |  |
| --- | --- | --- |
|  | C | D |
| A | 2, 2 | 3, 1 |
| B | 4, 0 | 1, 3 |

Row

U(A) = U(B)

2p + (1-p)3 = 4p + 1(1-p)

2p =2(1-p) => p =1/2

U(C) = U(D)

2p + (1-p)\*0 = p + (1-p)\*3

P = (1-p)\*3 => 4p = 3 => 3/4

Equilibria = ((3/4,1/4),(1/2,1/2))

|  |  |  |
| --- | --- | --- |
|  | C | D |
| A | 1, 1 | 2, 0 |
| B | 0, 4 | 3, 5 |