

1. (20 Points) A person has \$1,000 to invest. The choice is either (i) a bond with a guaranteed return of 8%, or (ii) a stock which will lose 10% in value with 20% probability, will gain 5% in value with 40% probability, and will gain 20% in value with 40% probability.
 - (a) If the person has a utility function of $u(w) = w^2$ which type of investment should the person make (based on expected utility)?
 - (b) If the person has a utility function of $u(w) = \sqrt{w}$ which type of investment should the person make (based on expected utility)?
2. (20 Points) Find a (pure strategy) Nash equilibrium for the bimatrix game where the payoff for player one is given by the matrix A and the payoff for player two is given by the matrix B where

$$A = \begin{pmatrix} 0 & 5 & 3 \\ 2 & 0 & 0 \\ 3 & 4 & 0 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 0 & 3 & 2 \\ 0 & 1 & 0 \\ 4 & 3 & 0 \end{pmatrix}.$$

3. (20 Points) Consider the bimatrix game with

$$A = \begin{pmatrix} 0 & 2 & 0 \\ 1 & 0 & 1 \\ 3 & 0 & 0 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 0 & 0 & 1 \\ 2 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix}.$$

Find the (interior) Nash equilibrium with mixed strategies.

4. (20 Points) Consider the two-person strategic form game with strategy sets $S_1 = S_2 = [0, 1]$ and utility functions

$$u_1(x, y) = y^2 - xy - x^2 + 2x + y \quad \text{and} \quad u_2(x, y) = x^2 - 2xy - 3y^2 + 5y,$$

where the first player chooses the value of x in $[0, 1] \subset \mathbb{R}$ and the second player choose the value of y in $[0, 1] \subset \mathbb{R}$. Find the Nash equilibrium.

5. (20 Points) A person has the decision graph given below, where the numbers on the edges represent the cost of moving along that edge. What path should the person take to minimizing the cost from the root R to the terminal node D?

