Problem 1 of 5

For the following game, find the safety levels of both players and all pure strategic equilibria

\[
\begin{pmatrix}
(0, 2) & (1, -1) & (2, 1) \\
(2, 2) & (-1, 2) & (4, 1) \\
(-1, 3) & (2, -2) & (0, 2) \\
(1, 1) & (2, 2) & (2, 0)
\end{pmatrix}
\]

Problem 2 of 5

Contestants I and II start the game with $100 and $200 dollars respectively. Each must decide to pass or gamble, not knowing the choice of the other. A player who passes keeps the money he/she started with. If Player I gambles, he wins $200 with probability 1/2 or loses $100 with probability 1/2. If Player II gambles, she wins or loses $200 with probability 1/2 each. These outcomes are independent. Then the contestant with the higher amount at the end wins a bonus of $300.

1. Draw the Kuhn tree.
2. Put into strategic form.
3. Find the safety levels.

Problem 3 of 5

Prove that in a two-person general sum game, the expected payoff of any player at any Strategic Equilibrium (mixed or pure) can not be smaller than the safety level of this player.

Problem 4 of 5

Find all the Nash equilibria in the game with the matrix

\[
\begin{pmatrix}
(1, 3) & (4, -1) \\
(3, 1) & (2, 2)
\end{pmatrix}
\]

Problem 5 of 5

Let \((A, B)\) be a constant-sum game, i.e. there exists a constant \(L\) such that for every \(i, j, a_{ij} + b_{ij} = L\). Prove that for every two Nash equilibria the payoffs of R are the same.

Hint: If \(L = 0\), it is a zero-sum game, and we can use Minimax Theorem.