Name:

Test 1: Ch. 3-4

Complete the following problems to the best of your ability. **SHOW ALL OF YOUR WORK.** Unshown work will not be graded. You may use a calculator.

1. I've been playing Subnautica all weekend, and I want to improve my seabase a little bit. I've got 13 chunks of Titanium, 10 chunks of Quartz, and 5 chunks of Copper Ore. There are three things I can build; Solar panels, which take 2 titanium, 2 quartz and 1 copper; Hatches, which take 2 titanium and 1 quartz; and radio devices, which take 1 titanium and 1 copper to build. I want to know how many panels, hatches and radios should I build if I want to use all of my resources.

   (a) [10] Model this scenario as either a system of equations or a table.

   (b) [15] Convert your system into an augmented matrix and use the Gauß-Jordan method to solve it.

2. Let

$$A = \begin{bmatrix} 3 & 5 & 7 \\ 1 & 2 & 3 \\ 2 & 3 & 5 \end{bmatrix}$$

(a) [15] Find A^{-1}.

(b) [5] Suppose $B = [0, 1, -4]^T$ and $X = [x, y, z]^T$. Write the system of equations that the matrix equation $AX = B$ represents.

(c) [10] Solve $AX = B$ (that is, tell me what x, y and z must be. You may use your calculator for matrix multiplication on this problem, if you choose a method that involves it).

(d) [5] If $B = [1, 5, -2]^T$. Now solve the system (above stipulations apply).

3. Roland and Carol are playing a game represented by the following payoff matrix

$$P = \begin{array}{c} \\ r \\ s \\ t \end{array} \begin{array}{c} \begin{array}{ccc} a & b & c \end{array} \\ \begin{pmatrix} 1 & 0 & -1 \\ -2 & 3 & 1 \\ 0 & -4 & -5 \end{pmatrix} \end{array}$$

(a) [10] Reduce P by dominance.

(b) [15] Find the optimal mixed strategy for Roland, the row player.

(c) [15] Find the optimal mixed strategy for Carol, the column player.

(d) [5] What is the expected payoff of this game? You may do your matrix multiplication with a calculator if you wish.