

CS 6505 - Homework 6

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$$\left[\begin{array}{ccc|c} 4 & 2 & 0 & 1 \\ 0 & 2 & 1 & 2 \\ 1 & 0 & 1 & 0 \end{array} \right] \quad (1)$$

Reduce modulo 3.

$$\left[\begin{array}{ccc|c} 1 & 2 & 0 & 1 \\ 0 & 2 & 1 & 2 \\ 1 & 0 & 1 & 0 \end{array} \right] \quad (2)$$

$$R_3 = R_3 - R_1.$$

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 2 & 1 & 2 \\ 0 & -2 & 1 & -1 \end{array} \right] \quad (3)$$

Reduce mod 3.

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 2 & 1 & 2 \\ 0 & 1 & 1 & 2 \end{array} \right] \quad (4)$$

$$R_2 = R_2 - 2R_3.$$

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 0 & -1 & -2 \\ 0 & 1 & 1 & 2 \end{array} \right] \quad (5)$$

Reduce mod 3 and switch rows 2 and 3.

$$\left[\begin{array}{ccc|c} 1 & 2 & 1 & 0 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{array} \right] \quad (6)$$

$$R_1 = R_1 - 2R_2.$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -1 & -4 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{array} \right] \quad (7)$$

Reduce mod 3.

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & 2 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{array} \right] \quad (8)$$

$$R_1 = R_1 - R_3.$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{array} \right] \quad (9)$$

$$R_2 = R_2 - \frac{1}{2}R_3. \quad R_3 = \frac{1}{2}R_3$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & \frac{3}{2} \\ 0 & 0 & 1 & \frac{1}{2} \end{array} \right] \quad (10)$$

Reduce mod 3 using the fact that the multiplicative inverse of 2, namely $\frac{1}{2}$ is 2 mod 3.

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{array} \right] \quad (11)$$

So, $x_1 = 1$, $x_2 = 0$, and $x_3 = 2$.