$x_1 = -5$

$-5-(-5)-2x_3 = -6$

$-5+5-2x_3 = -6$

$x_3 = 3$

Rickeil Jones Quiz #2

(a) $\begin{bmatrix} 2 & 1 & -1 \\ -3 & -1 & 2 \\ -2 & 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 5/3 \end{bmatrix}$ $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} 2 & 1 & -1 \\ -3 & -1 & 2 \\ -2 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}\begin{bmatrix} 0 \\ 1 \\ 5/3 \end{bmatrix}$

$\begin{bmatrix} -3 & -1 & 2 \\ 2 & 1 & 2 \\ 2 & 1 & -1 \end{bmatrix} x = \begin{bmatrix} 1 \\ 5/3 \\ 0 \end{bmatrix}$

$m_1 = m_0 - \left(\frac{1}{-3}\begin{bmatrix} -3 \\ -2 \\ 2 \end{bmatrix}\right)\begin{bmatrix} -3 & -1 & 2 \end{bmatrix}$

$m_0 - \begin{bmatrix} 1 \\ 2/3 \\ -2/3 \end{bmatrix}\begin{bmatrix} -3 & -1 & 2 \end{bmatrix}$

$m_0 - \begin{bmatrix} -3 & -1 & 2 \\ -2 & -2/3 & 4/3 \\ 2 & 2/3 & -4/3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 5/3 & 2/3 \\ 0 & 1/3 & 1/3 \end{bmatrix}$

$m_2 = m_1 - \left(\frac{1}{5/3}\begin{bmatrix} 0 \\ 5/3 \\ 1/3 \end{bmatrix}\right)\begin{bmatrix} 0 & 5/3 & 2/3 \end{bmatrix}$

$m_1 - \begin{bmatrix} 0 & 0 & 0 \\ 0 & 5/3 & 2/3 \\ 0 & 1/3 & 2/15 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1/5 \end{bmatrix}$

$m_3 = m_2 - \left(\frac{1}{1/5}\begin{bmatrix} 0 \\ 0 \\ 1/5 \end{bmatrix}\right)\begin{bmatrix} 0 & 0 & 1/5 \end{bmatrix}$

$m_2 - \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}\begin{bmatrix} 0 & 0 & 1/5 \end{bmatrix}$

$m_2 - \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1/5 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

$L = \begin{bmatrix} 1 & 0 & 0 \\ 2/3 & 1 & 0 \\ -2/3 & 3/15 & 1 \end{bmatrix}$ $U = \begin{bmatrix} -3 & -1 & 2 \\ 0 & 5/3 & 2/3 \\ 0 & 0 & 1/5 \end{bmatrix}$

$Ly = b$

$\begin{bmatrix} 1 & 0 & 0 \\ 2/3 & 1 & 0 \\ -2/3 & 3/15 & 1 \end{bmatrix} y = \begin{bmatrix} 1 \\ 5/3 \\ 0 \end{bmatrix}$

$y_1 = 1$

$\frac{2}{3}(1) + y_2 = 5/3$

$y_2 = 1$

$-2/3(1) + 3/15(1) + y_3 = 0$

$y_3 = -3/15 + \frac{10}{15}$

$y_3 = 7/15$

$Ux = y$

$\begin{bmatrix} -3 & -1 & 2 \\ 0 & 5/3 & 2/3 \\ 0 & 0 & 1/5 \end{bmatrix} x = \begin{bmatrix} 1 \\ 1 \\ 7/15 \end{bmatrix}$

$(5)\frac{1}{5}x_3 = \frac{7}{15}(5)$

$x_3 = 35/15 = 7/3$

$5/3x_2 + 2/3(7/3) = 1$

$(3/5)\,5/3x_2 = \frac{9}{9} - \frac{14}{9} = -5/9\,(3/5)$

$x_2 = \frac{-15}{45} = -\frac{1}{3}$

$-3x_1 + 1/3 + 2(7/3) = 1$

$3x_1 = \frac{3}{3} - \frac{1}{3} - \frac{14}{3} = -\frac{12}{3}$

$x_1 = \frac{12}{9} = \frac{4}{3}$

$x = \begin{bmatrix} 4/3 \\ -1/3 \\ 7/3 \end{bmatrix}$

2b) $m_0 = \begin{bmatrix} -2 & 2 & -4 & -2 \\ 1 & -2 & 1 & 5 \\ -1 & 1 & 0 & -2 \\ 0 & 1 & 1 & -2 \end{bmatrix}$

$m_1 = m_0 - \left(\frac{1}{-2}\begin{bmatrix} -2 \\ 1 \\ -1 \\ 0 \end{bmatrix}\right)\begin{bmatrix} -2 & 2 & -4 & -2 \end{bmatrix}$

$m_0 - \begin{bmatrix} 1 \\ -1/2 \\ 1/2 \\ 0 \end{bmatrix}\begin{bmatrix} -2 & 2 & -4 & -2 \end{bmatrix}$

$m_0 - \begin{bmatrix} -2 & 2 & -4 & -2 \\ 1 & -1 & 2 & 1 \\ -1 & 1 & -2 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & -1 & -1 & 4 \\ 0 & 0 & 2 & -1 \\ 0 & 1 & 1 & -2 \end{bmatrix}$

$m_2 = m_1 - \left(\frac{1}{-1}\begin{bmatrix} 0 \\ -1 \\ 0 \\ 1 \end{bmatrix}\right)\begin{bmatrix} 0 & -1 & -1 & 4 \end{bmatrix}$

$m_1 - \begin{bmatrix} 0 \\ 1 \\ 0 \\ -1 \end{bmatrix}\begin{bmatrix} 0 & -1 & -1 & 4 \end{bmatrix}$

$m_1 - \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & -1 & -1 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & -1 & 1 & -4 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & 2 \end{bmatrix}$

$m_3 = m_2 - \left(\frac{1}{2}\begin{bmatrix} 0 \\ 0 \\ 2 \\ 0 \end{bmatrix}\right)\begin{bmatrix} 0 & 0 & 2 & -1 \end{bmatrix}$

$m_2 - \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}\begin{bmatrix} 0 & 0 & 2 & -1 \end{bmatrix}$

$m_2 - \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}$

$m_4 = m_3 - \left(\frac{1}{2}\begin{bmatrix} 0 \\ 0 \\ 0 \\ 2 \end{bmatrix}\right)\begin{bmatrix} 0 & 0 & 0 & 2 \end{bmatrix}$

$m_3 - \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}\begin{bmatrix} 0 & 0 & 0 & 2 \end{bmatrix}$

$m_3 - \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

$x = \begin{bmatrix} -21/8 \\ -9/8 \\ 5/8 \\ -1/4 \end{bmatrix}$

$L = \begin{bmatrix} 1 & 0 & 0 & 0 \\ -1/2 & 1 & 0 & 0 \\ 1/2 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{bmatrix}$ $U = \begin{bmatrix} -2 & 2 & -4 & -2 \\ 0 & -1 & -1 & 4 \\ 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & 2 \end{bmatrix}$

$Ly = b$

$\begin{bmatrix} 1 & 0 & 0 & 0 \\ -1/2 & 1 & 0 & 0 \\ 1/2 & 0 & 1 & 0 \\ 0 & -1 & 0 & 1 \end{bmatrix} y = \begin{bmatrix} 1 \\ -1 \\ 2 \\ 0 \end{bmatrix}$

$y_1 = 1$ $\quad -\frac{1}{2}(1) + y_2 = -1$

$y_2 = -1 + 1/2$

$y_2 = -1/2$ $\quad 1/2(1) + y_3 = 2$

$y_3 = 2 - 1/2$

$y_3 = 3/2$ $\quad -1(1/2) + y_4 = 0$

$y_4 = 0 - 1/2$

$y_4 = -1/2$

$UX = Y$

$\begin{bmatrix} -2 & 2 & -4 & -2 \\ 0 & -1 & -1 & 4 \\ 0 & 0 & 2 & -1 \\ 0 & 0 & 0 & 2 \end{bmatrix} x = \begin{bmatrix} 1 \\ -1/2 \\ 3/2 \\ -1/2 \end{bmatrix}$

$2x_4 = -1/2$

$x_4 = -1/4$

$2x_3 - 1(-1/4) = 3/2$

$2x_3 + \frac{1}{4} = 3/2$

$\frac{2x_3}{2} = \frac{6/4 - 1/4}{2} =$

$x_3 = 5/8$

$-x_2 - 5/8 + 4(-1/4) = -1/2$

$-x_2 = -\frac{4}{8} + 5/8 + \frac{8}{8}$

$x_2 = -9/8$

$-2x_1 + 2(-9/8) + -4(5/8) + -2(-1/4)$

$-2x_1 - 18/8 - 20/8 + 4/8 = 8/8$

$-2x_1 = 42/8$

$x_1 = -42/16$

$x_1 = -21/8$