System of Linear Equations

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ -x_1 + 3x_2 + x_3 &= 0 \\ 2x_1 - x_2 + x_3 &= 1 \end{aligned}$$

Add equations 1 to equation 2:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + 4x_2 + 4x_3 &= 2 \\ 2x_1 - x_2 + x_3 &= 1 \end{aligned}$$

Add -2 times equation 1 to equation 3:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + 4x_2 + 4x_3 &= 2 \\ 0x_1 - 3x_2 - 5x_3 &= -3 \end{aligned}$$

Add 3/4 times equation 2 to equation 3:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + 4x_2 + 4x_3 &= 2 \\ 0x_1 + 0x_2 - 2x_3 &= -3/2 \end{aligned}$$

Multiply equation 2 by 1/4:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + x_2 + x_3 &= 1/2 \\ 0x_1 + 0x_2 - 2x_3 &= -3/2 \end{aligned}$$

Multiply equation 3 by $-1/2$:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + x_2 + x_3 &= 1/2 \\ 0x_1 + 0x_2 + x_3 &= 3/4 \end{aligned}$$

Add -1 times equation 3 to equation 2:

$$\begin{aligned} x_1 + x_2 + 3x_3 &= 2 \\ 0x_1 + x_2 + 0x_3 &= -1/4 \\ 0x_1 + 0x_2 + x_3 &= 3/4 \end{aligned}$$

Augmented Matrix

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

Add row 1 to row 2:

$$\left[\begin{array}{ccc|c} 1 & 1 & 3 & 2 \\ 0 & 4 & 4 & 2 \\ 2 & -1 & 1 & 1 \end{array}\right]$$

Add -2 times row 1 to row 3:

$$\left[\begin{array}{ccc|c} 1 & 1 & 3 & 2 \\ 0 & 4 & 4 & 2 \\ 0 & -3 & -5 & -3 \end{array}\right]$$

Add 3/4 times row 2 to row 3:

$$\left[\begin{array}{ccc|c} 1 & 1 & 3 & 2 \\ 0 & 4 & 4 & 2 \\ 0 & 0 & -2 & -3/2 \end{array}\right]$$

Multiply row 2 by 1/4:

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

Multiply row 3 by -1/2:

$$\left[\begin{array}{ccc|c} 1 & 1 & 3 & 2 \\ 0 & 1 & 1 & 1/2 \\ 0 & 0 & 1 & 3/4 \end{array}\right]$$

Add -1 times row 3 to row 2:

$$\left[\begin{array}{ccc|c} 1 & 1 & 3 & 2 \\ 0 & 1 & 0 & -1/4 \\ 0 & 0 & 1 & 3/4 \end{array}\right]$$

System of Linear Equations

Add -3 times equation 3 to equation 1:

$$\begin{aligned} x_1 + x_2 + 0x_3 &= -1/4 \\ 0x_1 + x_2 + 0x_3 &= -1/4 \\ 0x_1 + 0x_2 + x_3 &= 3/4 \end{aligned}$$

Add -1 times equation 2 to equation 1:

$$\begin{aligned} x_1 + 0x_2 + 0x_3 &= 0 \\ 0x_1 + x_2 + 0x_3 &= -1/4 \\ 0x_1 + 0x_2 + x_3 &= 3/4 \end{aligned}$$

So $x_1 = 0$, $x_2 = -1/4$ and $x_3 = 3/4$.

Augmented Matrix

Add -3 times row 3 to row 1:

$$\left[\begin{array}{ccc|c} 1 & 1 & 0 & -1/4 \\ 0 & 1 & 0 & -1/4 \\ 0 & 0 & 1 & 3/4 \end{array}\right]$$

Add -1 times row 2 to row 1:

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1/4 \\ 0 & 0 & 1 & 3/4 \end{array}\right]$$

So $x_1 = 0$, $x_2 = -1/4$ and $x_3 = 3/4$.