Solving a System of Three Equations Using Matrices

Name _____

Date _____ Period _____

Turning a system of equations into an augmented matrix.

$$\begin{aligned} 2x - 3y - z &= 0 \\ -x + 2y + z &= 5 \\ 3x + 4y - z &= 1 \end{aligned}$$

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

$$\begin{aligned} 3x - 2y + 2z &= 6 \\ 7x - 3y + 2z &= -1 \\ 2x - 3y + 4z &= 0 \end{aligned}$$

$$\left[\begin{array}{cccc} 3 & -2 & 2 & 6 \\ 7 & -3 & 2 & -1 \\ 2 & -3 & 4 & 0 \end{array}\right]$$

Row Operations can be performed on each row to manipulate the values in each row.

Three Row Operations

1. Interchange any two rows.
2. Replace a row by a nonzero multiple of that row.
3. Replace a row by the sum of that row and a constant nonzero multiple of some other row.

$$\begin{array}{c} r_1 \\ r_2 \\ r_3 \end{array}\left[\begin{array}{cccc} 2 & -3 & -1 & 0 \\ -1 & 2 & 1 & 5 \\ 3 & 4 & -1 & 1 \end{array}\right]$$

interchange r_1 with r_2

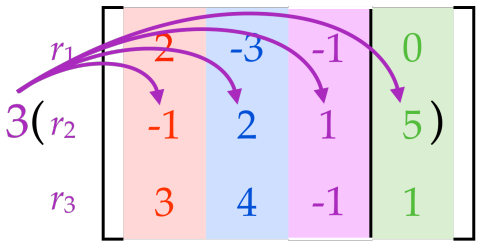
$$\begin{array}{c} r_1 \\ r_2 \\ r_3 \end{array}\left[\begin{array}{cccc} & & & \\ & & & \\ & & & \end{array}\right]$$

Three Row Operations

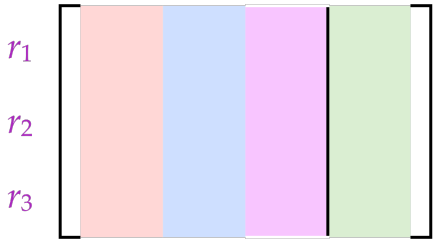
1. Interchange any two rows.

2. Replace a row by a nonzero multiple of that row.

3. Replace a row by the sum of that row and a constant nonzero multiple of some other row.



$R_2 = 3 \cdot r_2$

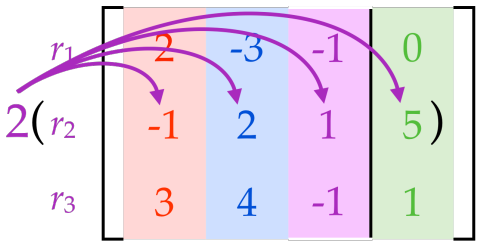


Three Row Operations

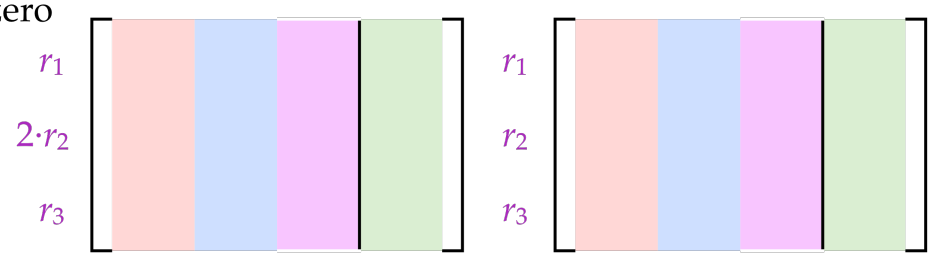
1. Interchange any two rows.

2. Replace a row by a nonzero multiple of that row.

3. Replace a row by the sum of that row and a constant nonzero multiple of some other row.



$R_3 = 2 \cdot r_2 + r_3$



Three Row Operations

1. Interchange any two rows.

2. Replace a row by a nonzero multiple of that row.

3. Replace a row by the sum of that row and a constant nonzero multiple of some other row.

Row Echelon Form

$$\left[\begin{array}{cccc} 1 & a & b & d \\ 0 & 1 & c & e \\ 0 & 0 & 1 & f \end{array}\right]$$

create a diagonal of 1's
with 0's under the 1's

a, b, c, d, e and f are constants that help us solve for our x, y and z variables.

$$\begin{aligned} x - y + z &= 8 \\ 2x + 3y - z &= -2 \\ 3x - 2y - 9z &= 9 \end{aligned}$$

$$\left[\begin{array}{cccc} 1 & a & b & d \\ 0 & 1 & c & e \\ 0 & 0 & 1 & f \end{array}\right]$$

$$\begin{aligned} x - y + z &= -4 \\ 2x - 3y + 4z &= -15 \\ 5x + y - 2z &= 12 \end{aligned}$$

$$\left[\begin{array}{cccc} 1 & a & b & d \\ 0 & 1 & c & e \\ 0 & 0 & 1 & f \end{array}\right]$$