# Systems of Equations and Augmented Matrices

Finite Math

18 October 2018

# Quiz

Write the augmented matrix for the system of equations

$$\begin{array}{rcrcr} x & + & 3y & = & 18 \\ 2x & - & y & = & 16 \end{array}$$

# Example

## Example

*Solve the system using an augmented matrix*

$$\begin{array}{rcrcl} 2x_1 & - & 3x_2 & = & 6 \\ 3x_1 & + & 4x_2 & = & \frac{1}{2} \end{array}$$

# Now You Try It!

## Example

*Solve the system using an augmented matrix*

$$\begin{array}{rcrcl} 5x & - & 2y & = & 11 \\ 2x & + & 3y & = & \frac{5}{2} \end{array}$$

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*Solve the system using an augmented matrix*

$$\begin{array}{rcrcl} 5x & - & 2y & = & 11 \\ 2x & + & 3y & = & \frac{5}{2} \end{array}$$

## Solution

$x = 2, y = -\frac{1}{2}$

# Example

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*Solve the system using an augmented matrix*

$$\begin{array}{rcrcr} 2x & - & y & = & 4 \\ -6x & + & 2y & = & -12 \end{array}$$

# Now You Try It!

## Example

*Solve the systems using an augmented matrix*

1. $$\begin{array}{rcrcr} 2x_1 & - & x_2 & = & -7 \\ x_1 & + & 2x_2 & = & 4 \end{array}$$

2. $$\begin{array}{rcrcr} -2x_1 & + & 6x_2 & = & 6 \\ 3x_1 & - & 9x_2 & = & -9 \end{array}$$

3. $$\begin{array}{rcrcr} 2x_1 & - & x_2 & = & 6 \\ 4x_1 & - & 2x_2 & = & -1 \end{array}$$

4. $$\begin{array}{rcrcr} 2x & + & y & = & 1 \\ 4x & - & y & = & -7 \end{array}$$

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## Solution

*1.* $(-2, 3)$, *2. for a real number* $t$: $(3t - 3, t)$, *3. no solution, 4.* $(-1, 3)$

# Final Answer Forms

We mentioned above that the final form an augmented matrix with *exactly one solution* should look like

$$\left[\begin{array}{cc:c} 1 & 0 & m \\ 0 & 1 & n \end{array}\right]$$

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and if it has no solution, it takes the form

$$\left[\begin{array}{cc:c} 1 & m & n \\ 0 & 0 & p \end{array}\right]$$

where $p \neq 0$.

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## Example

*Solve the systems using an augmented matrix*

1. $$\begin{array}{rcrcr} x & - & 4y & = & -2 \\ -2x & + & y & = & -3 \end{array}$$

2. $$\begin{array}{rcrcr} 2x & - & 3y & = & -2 \\ -4x & + & 6y & = & 7 \end{array}$$

3. $$\begin{array}{rcrcr} 0.3x & - & 0.6y & = & 0.18 \\ 0.5x & - & 0.2y & = & 0.54 \end{array}$$

4. $$\begin{array}{rcrcr} 2x & - & 4y & = & 2 \\ -3x & + & 6y & = & -3 \end{array}$$

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$$\begin{array}{rcrcr} 2x & - & 4y & = & 2 \\ -3x & + & 6y & = & -3 \end{array}$$

## Solution

*1.* $(2, 1)$, *2. no solution, 3.* $(1.2, 0.3)$, *4. for a real number* $k$: $(2k + 1, k)$.