

## 10.2 #21: Find the point of intersection

$$x + y + z = 4$$

$$x + 3y + 3z = 10$$

$$2x + y - z = 3$$

See next  
slide for  
more help



STEP 1:

Eliminate  $z$  by adding the  
1<sup>st</sup> and 3<sup>rd</sup> equations

STEP 2:

Eliminate  $z$  again using a  
different pair of equations  
(1<sup>st</sup> and 2<sup>nd</sup> or 2<sup>nd</sup> and 3<sup>rd</sup>)

STEP 3:

Solve system of two  
equations that you just  
created and go from there.

## 10.2 #21: Find the point of intersection

$$x + y + z = 4 \quad (1^{\text{st}})$$

$$x + 3y + 3z = 10$$

$$2x + y - z = 3 \quad (3^{\text{rd}})$$

STEP 1:

Eliminate  $z$  by adding the  
1<sup>st</sup> and 3<sup>rd</sup> equations

$$\begin{array}{r} x + y + \overset{0}{z} = 4 \\ + \quad 2x + y - z = 3 \\ \hline 3x + 2y = 7 \end{array}$$

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# 10.2 #21: Find the point of intersection

$$x + y + z = 4$$

$$x + 3y + 3z = 10 \quad \text{(2nd)}$$

$$(2x + y - z = 3) \quad \text{(3rd)}$$

$$\begin{array}{r} x + y + \overset{0}{z} = 4 \\ + 2x + y - z = 3 \\ \hline \end{array}$$

$$3x + 2y = 7$$

$$\begin{array}{r} x + 3y + \overset{0}{z} = 10 \\ 6x + 3y - 3z = 9 \\ \hline \end{array}$$

multiply by 3  
add

$$7x + 6y = 19$$

STEP 2:

Eliminate z again using a different pair of equations (1<sup>st</sup> and 2<sup>nd</sup> or 2<sup>nd</sup> and 3<sup>rd</sup>)

Step 3

now solve these two equations together

See next slide for more help

## 10.2 #21: Find the point of intersection

$$x + y + z = 4$$

$$x + 3y + 3z = 10 \quad \text{(2nd)}$$

$$(2x + y - z = 3) \quad \text{(3rd)}$$

$$\begin{array}{r} x + 3y + 3z = 10 \\ 6x + 3y - 3z = 9 \\ \hline 7x + 6y = 19 \end{array}$$

multiply by 3  
add

$$\begin{array}{r} x + y + z = 4 \\ + 2x + y - z = 3 \\ \hline 3x + 2y = 7 \end{array}$$

$$3x + 2y = 7$$

$$\begin{array}{r} -3(3x + 2y = 7) \\ 7x + 6y = 19 \end{array}$$

**STEP 3:**  
Solve system of two equations that you just created

- multiply by  $-3$  to eliminate  $y$
- solve for  $x$ , then find  $y + z$  using back substitution

## 10.2 #21: Find the point of intersection

$$x + y + z = 4$$

$$x + 3y + 3z = 10$$

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STEP 3:

Solve system of two equations that you just created and go from there.

$$-3(3x + 2y = 7)$$

$$7x + 6y = 19$$

$$\begin{array}{r} -9x - 6y = -21 \\ 7x + 6y = 19 \quad \text{add} \\ \hline -2x = -2 \end{array}$$

$$-2x = -2$$

$$x = 1$$

substitute back into a previous equation

$$3(1) + 2y = 7$$

$$y = 2$$

back substitute again

$$x + y + z = 4$$

$$1 + 2 + z = 4$$

$$z = 1$$

$$\text{solution } (1, 2, 1)$$

- multiply by  $-3$  to eliminate  $y$
- solve for  $x$ , then find  $y$  +  $z$  using back substitution