

# T6-2 Substitution (Variable Alone)

EX.

$$2(x) + 3y = 16$$

alone!  $\rightarrow x = (2y - 6)$

Sub.

$$2(2y - 6) + 3y = 16 \quad \star$$

Solve.

$$4y - 12 + 3y = 16$$

$$7y - 12 = 16$$

$$+12 \quad +12$$

$$7y = 28$$

$$y = 4$$

Sub  
Solved

$$x = 2(4) - 6$$

$$x = 8 - 6$$

$$x = 2 \quad \checkmark$$

$\rightarrow$  One Sol:  $(\underset{x}{2}, \underset{y}{4}) \checkmark \star$

Verify.

$$2x + 3y = 16 \quad \star$$

$$2(2) + 3(4) = ? 16$$

$$4 + 12 = 16 \quad \checkmark$$

You.

$$x - 3(y) = 3$$

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

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

$$x - 9x - 21 = 3$$

$$-8x - 21 = 3$$

$$+21 \quad +21$$

$$-8x = 24$$

$$\frac{-8}{-8} \quad \frac{24}{-8}$$

$$x = -3$$

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

$$-9 + 7$$

$$y = -2$$

One Sol:  $(-3, -2)$

$$-3 - 3(-2) = 3$$

$$-3 + 6 = 3 \quad \checkmark$$

## T6-2 Substitution (Variable NOT alone)

EX.  $x + 2y = 13$   
*easiest almost alone*  $-2(x) - 3y = -18$

Get X alone!  $x + 2y = 13$   
★  $\downarrow -2y \quad -2y$   
 $x = (13 - 2y)$

Sub  
Solve

$$-2(13 - 2y) - 3y = -18$$

$$-26 + 4y - 3y = -18$$

$$\begin{array}{r} -26 + 1y = -18 \\ +26 \quad \quad \quad +26 \end{array}$$

$$1y = 8$$

Sub  
Solve

$$x + 2(8) = 13$$

$$x + 16 = 13$$

$$\begin{array}{r} -16 \quad -16 \end{array}$$

$$x = -3$$

★ One Sol:  $(\underset{x}{-3}, \underset{y}{8}) \checkmark$

Verify

$$-2x - 3y = -18$$

$$-2(-3) - 3(8) = ? -18$$

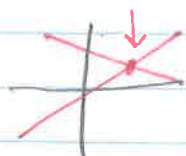
★

$$-18 = -18$$

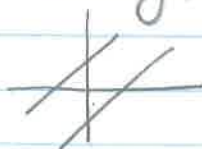
You:  $4x + 3y = 29$   
*easiest*  $y + 3x = 18$

1/28 HW p347 #8-11, 14-18  
 1/30 homework p347 #4-6, 12, 13, 19-22.

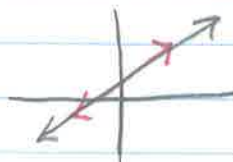
## Tle-2 Other types of Sol.



one



none  
(parallel)  
same slope



Many

Same line

No Solution

$$\begin{aligned} 2x + 2y &= 8 \\ x + y &= -2 \\ -x & \qquad -x \\ \hline y &= -2 - x \\ 2x + 2(-2 - x) &= 8 \\ \cancel{2x} - 4 - \cancel{2x} &= 8 \\ -4 &= 8 \end{aligned}$$

False

No Solution! ✓

Verify: check that slope is equal

$$\begin{aligned} 2x + 2y &= 8 \\ -2x & \qquad -2x \\ \hline 2y &= 8 - 2x \\ \frac{2y}{2} &= \frac{8 - 2x}{2} \\ y &= 4 - x \end{aligned}$$

m = -1 on both!

Many Solutions

$$\begin{aligned} y &= (2x + 6) \\ 2x - y &= -6 \\ \downarrow & \qquad \downarrow \\ 2x - (2x + 6) &= -6 \\ \cancel{2x} - \cancel{2x} - 6 &= -6 \\ -6 &= -6 \end{aligned}$$

-6 = -6

TRUE

All Solutions

Check solve for y!

$$\begin{aligned} 2x - y &= -6 \\ -2x & \qquad -2x \\ \hline -y &= -2x - 6 \\ \frac{-y}{-1} &= \frac{-2x - 6}{-1} \\ y &= 2x + 6 \end{aligned} \quad \text{SAME EQ}$$