

## 6-2 Substitution

**Substitution** - Solving one equation for one variable then substituting that solution into the second equation to solve for the other variable. Duh!! **Substitute** :)

**Study Tip** pg. 345

If both equations are in the form  $y=mx+b$  they can simply be set equal to each other and then solved for  $x$ . Then **substitute** your solution for  $x$  back into the equation to solve for  $y$ .

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9.)  $y = 20x + 35$   
 $y = 10x + 85$   
 $f(x) = g(x)$

$$\begin{array}{r} 20x + 35 = 10x + 85 \\ -10x \quad -10x \\ \hline 10x + 35 = 85 \\ -35 \quad -35 \\ \hline 10x = 50 \\ \frac{10x}{10} = \frac{50}{10} \\ x = 5 \end{array}$$

$y = 20(5) + 35$   
 $y = 100 + 35$   
 $y = 135$

$(5, 135)$

$x = 5$

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$$y = 2x + 1$$
$$\boxed{3x + y = -9} \quad y = -3x - 9$$

$$3x + 2x + 1 = -9$$

$$5x + 1 = -9$$

$$\frac{5x}{5} = \frac{-10}{5}$$

$$x = -2$$

$$y = 2x + 1$$

$$y = 2(-2) + 1$$

$$-4 + 1$$

$$y = -3$$

$$(-2, -3)$$

1A.)

$$\begin{aligned}y &= 4x - 6 \\5x + 3y &= -1 \\5x + 3(4x - 6) &= -1 \\5x + 12x - 18 &= -1 \\17x - 18 &= -1 \\+18 &+18 \\17x &= 17 \\x &= 1\end{aligned}$$

$$\begin{aligned}y &= 4x - 6 \\y &= 4(1) - 6 \\y &= 4 - 6 \\y &= -2\end{aligned}$$

$$(1, -2)$$

1B.)

$$2x + 5y = -1$$

$$y = 3x + 10$$

$$2x + 5(3x + 10) = -1$$

$$2x + 15x + 50 = -1$$

$$17x + \cancel{50} = -1$$

-50   -50

$$17x = -51$$

$$x = -3$$

$$y = 3x + 10$$

$$y = 3(-3) + 10$$

$$y = -9 + 10$$

$$y = 1$$

$$(-3, 1)$$

Ex: 2)

$$\boxed{x + 2y = 6} \Rightarrow x = -2y + 6$$

$$3x - 4y = 28$$

$$x = -2y + 6$$

$$3(-2y + 6) - 4y = 28$$

$$-6y + 18 - 4y = 28$$

$$-10y + 18 = 28$$

$$\frac{-10y}{-10} = \frac{10}{-10}$$

$$y = -1$$

$$x = -2y + 6$$

$$x = -2(-1) + 6$$

$$x = 2 + 6$$

$$x = 8$$

$$(x, y)$$

$$(8, -1)$$

2A.  $4x + 5y = 11$   
 $y - 3x = -13$  so  $y = 3x - 13$

$$4x + 5(3x - 13) = 11$$

$$4x + 15x - 65 = 11$$

$$19x - 65 = 11$$

$$19x = 76$$

$$x = 4$$

$$(4, -1)$$

$$4x + 5y = 11$$

$$4(4) + 5y = 11$$

$$16 + 5y = 11$$

$$-16 + 5y = -16$$

$$5y = -5$$

$$y = -1$$

2B.)

$$x - 3y = -9 \quad \text{so } \boxed{x = 3y - 9}$$

$$5x - 2y = 7$$

$$5(3y - 9) - 2y = 7$$

$$15y - 45 - 2y = 7$$

$$13y - 45 = 7$$

$$13y = 52$$

$$\boxed{y = 4}$$

$$x - 3(4) = -9$$

$$x - 12 = -9$$

$$\boxed{x = 3}$$

$$(3, 4)$$

$$y = 2x - 4$$
$$-6x + 3y = -12$$

$$-6x + 3(2x - 4) = -12$$

$$\boxed{-6x + 6x - 12 = -12}$$

problem

$$\underline{-12} = \underline{-12}$$

true so  $\boxed{\text{all real \#s}}$



3A.)

$$2x - y = 8$$
$$y = 2x - 3$$
$$2x - (2x - 3) = 8$$
$$\cancel{2x} - \cancel{2x} - 3 = 8$$
$$-3 \neq 8$$

NO SOLUTION

3B.)  $\begin{cases} 4x - 3y = 1 \\ 6y - 8x = -2 \end{cases}$

$\frac{4x - 3y = 1}{4} \Rightarrow \frac{4x}{4} = \frac{3y}{4} + \frac{1}{4}$

$x = \frac{3}{4}y + \frac{1}{4}$

$6y - 8\left(\frac{3}{4}y + \frac{1}{4}\right) = -2$

$\cancel{6y} - \cancel{6y} - \underline{2} = -2$

$-2 = -2$

true

$\boxed{\text{all real numbers}}$

$$4.) \quad x + y = \underline{32}$$
$$y = 5.4x$$

x = Reds  
y = Yankees

$$x + 5.4x = 32$$

$$\frac{6.4x}{6.4} = \frac{32}{6.4}$$

$$x = 5$$

$$y = 5.4x$$
$$y = 5.4(5)$$
$$y = 27$$

x  
Reds won 5  
y  
Yankees won 27

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#2  $(0, 2)$

#4 no solution

#6 infinitely many solutions  
(all real numbers)

SHOW YOUR WORK!