

5.1.2 notes

Wednesday, September 16, 2020 10:02 AM

Foundations and Precalculus 10

5.1/5.2 - Solving Systems of Equations (by Graphing)

Problem: My dad is 2 years older than my mom. The **sum** of their ages is 132 years. How old are they? let x be age of my dad, then my mom is $x-2$.

$$\begin{aligned} x + (x-2) &= 132 \\ 2x - 2 &= 132 \\ \frac{+2}{+2} & \\ \hline 2x &= 134 \\ \frac{2}{2} & \\ \hline x &= 67 \end{aligned}$$

A **linear** system of equations is 2 (or more) equations whose graphs make straight lines.
The solution to a linear system is values (x, y) that satisfy both (all) equations.

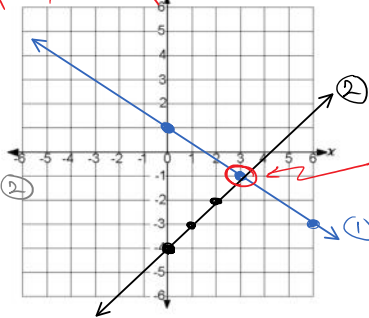
LS=RS

dad: $x \rightarrow 67$ years old
mom: $x-2 \rightarrow 67-2 = 65$ years old.

Example #1: Determine the solution to the linear system

① $y = -\frac{2}{3}x + 1$
 $m = -\frac{2}{3} = \frac{-2}{3}$ (rise $\rightarrow -2$, run $\rightarrow 3$)
 $b = 1$ (start here)

② $y = x - 4$
 $m = 1$, $b = -4$



Intersection point = solution:
 $(3, -1)$ or
 $x = 3$
 $y = -1$

Methods:
 1) graphing
 2) algebraic
 → substitution
 → elimination.

Proof/check: sub $(3, -1)$ into ① & ②

① $y = -\frac{2}{3}x + 1$
 $(-1) = -\frac{2}{3}(3) + 1$
 $-1 = -2 + 1$
 $-1 = -1 \checkmark$

② $y = x - 4$
 $(-1) = (3) - 4$
 $-1 = -1 \checkmark$

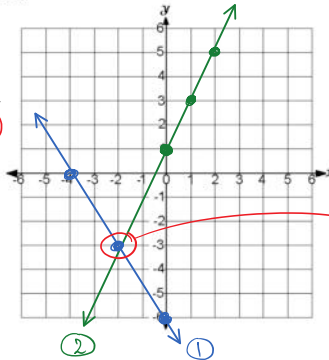
LS=RS **Example #2:** Determine the solution to the linear system.

① $3x + 2y = -12$
 ② $-2x + y = 1$

Method #1: $y = mx + b$

① $3x + 2y = -12$
 $-3x$
 $\frac{+2y}{2} = \frac{-3x-12}{2}$
 $y = -\frac{3}{2}x - 6$
 $m = -\frac{3}{2}$, $b = -6$

② $-2x + y = 1$
 $+2x$
 $y = 2x + 1$
 $m = 2$, $b = 1$



check:
 $(-2, -3)$

① $3(-2) + 2(-3) = -12$
 $-6 - 6 = -12$
 $-12 = -12 \checkmark$

② $-2(-2) + (-3) = 1$
 $4 - 3 = 1$
 $1 = 1 \checkmark$

Where graph crosses x-axis $\leftarrow y=0$
 "Foundations and Precalculus 10" y-axis $\leftarrow x=0$

Check $(-2, -3)$
 same as method #1

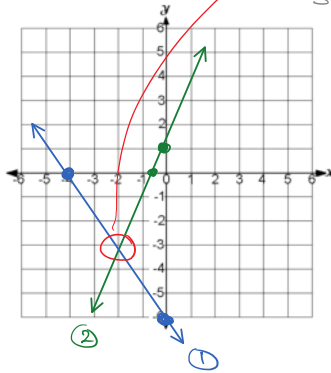
Method #2: x and y Intercepts

① $3x + 2y = -12$

② $-2x + y = 1$

x-int
 $3x + 2y = -12$
 $3(0) + 2y = -12$
 $2y = -12$
 $y = -6$

x-int
 $3x + 2y = -12$
 $3x + 2(0) = -12$
 $3x = -12$
 $x = -4$



x-int
 $-2x + y = 1$
 $-2x + (0) = 1$
 $-2x = 1$
 $\frac{-2x}{-2} = \frac{1}{-2}$
 $x = -\frac{1}{2}$

y-int
 $-2x + y = 1$
 $-2(0) + y = 1$
 $y = 1$

Example #3: Bill received and sent 60 text messages in one weekend. He sent 10 more messages than he received.

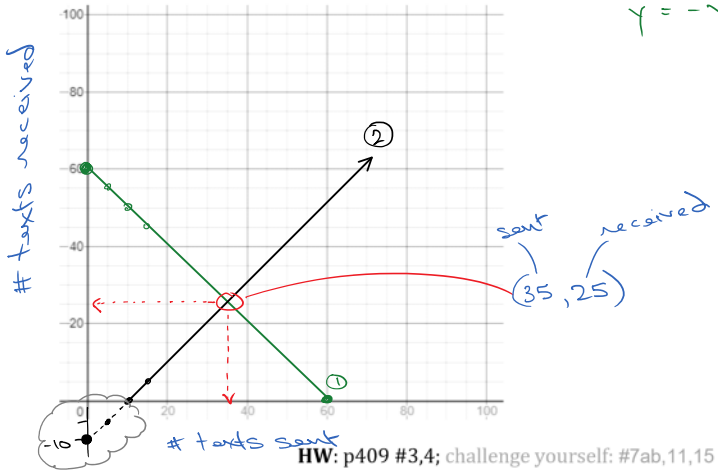
a) Write a linear system to model this situation.

Let x be number of text messages sent ^{more}
 Let y be number of text messages received.
 ① $x + y = 60$ ② $x - y = 10$

b) Graph the linear system then solve the problem. How many text messages did Bill send and how many did he receive?

① $x + y = 60$
 $\frac{-x}{-x} \quad \frac{-x}{-x}$
 $y = -x + 60$

② $x - y = 10$
 $\frac{-x}{-x} \quad \frac{-x}{-x}$
 $\frac{-y = -x + 10}{-1}$
 $y = x - 10$



no real meaning \rightarrow domain / range ...