7b - Solve systems of equations using substitution.

$y = 6 + x$
$y = -5 + 1/2x$

Graph showing the lines labeled $y = 6 + x$ and $y = -5 + 1/2x$

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

$y = -2x - 3$

$y = 3x + 1$
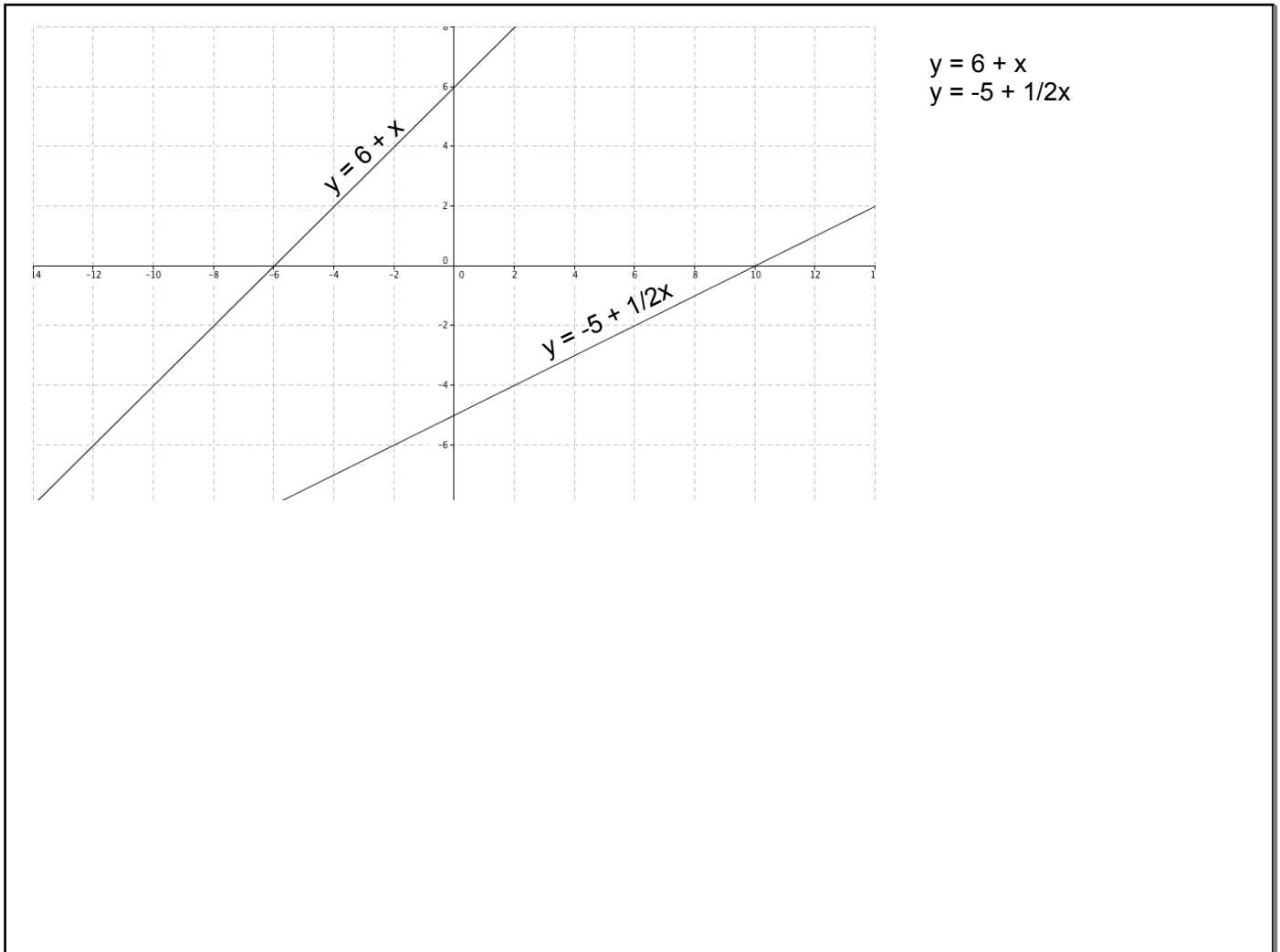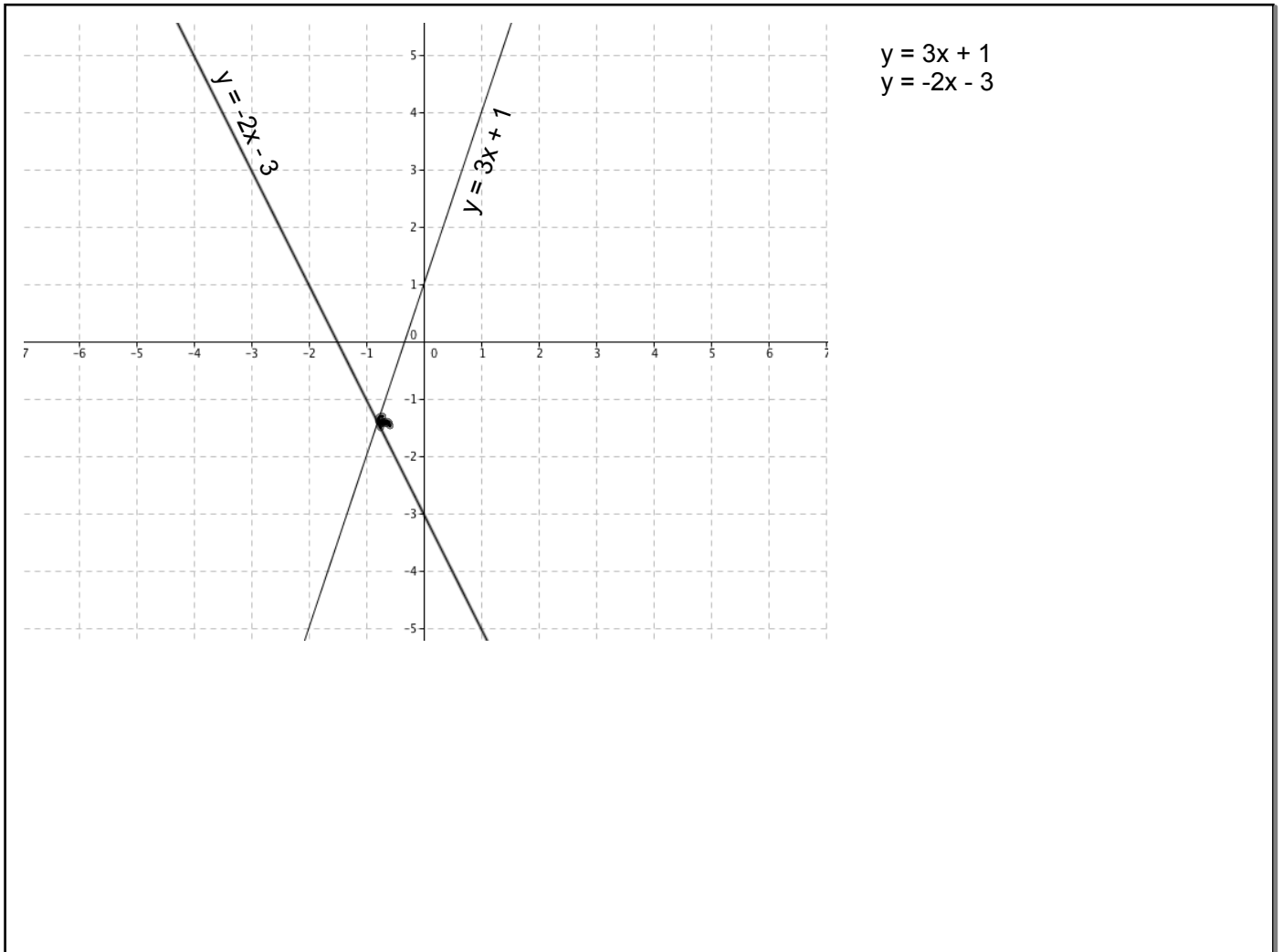
Graphing isn't always practical:

-Takes time

-Easy to make mistakes

-Sometimes the solution isn't clear

-The solution isn't always on the graphing plane

So... We have other ways to solve systems of equations

By Substitution:

1. One of the equations must be in x= or y= form (or whatever variables are given).

2. Then substitute (replace) the value into the other equation.

3. Solve for both variables.

$$y = 3x$$
$$x + 2y = -21$$

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

intersecting lines: $\boxed{y = -9}$

consistent - independent

$$\text{Solu}(-3, -9)$$

$$x + 2y = -21$$
$$x + 2(3x) = -21$$
$$x + 6x = -21$$
$$\frac{7x}{7} = \frac{-21}{7}$$
$$\boxed{x = -3}$$

Check: $(-3, -9)$

$$y = 3x$$
$$-9 = 3(-3)$$
$$-9 = -9 \checkmark$$

$$x + 2y = -21$$
$$-3 + 2(-9) = -21$$
$$-3 + {}^-18 = -21$$
$$-21 = -21 \checkmark$$

$6x - 2y = -4 \rightarrow \frac{-2y}{-2} = \frac{4}{-2} \frac{6x}{-2} \Rightarrow y = 2 + 3x$

$\underline{y} = 3x + 2$

$6x - 2y = -4$

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

$6x - 6x - 4 = -4$

$-4 = -4$

true

infinite solu.

Solu: any pt on the line $y = 3x + 2$.

Same lines.

consistent & dependent.

Check: let $x = 0$

$y = 3x + 2$

$y = 3(0) + 2$

$y = 2$

$(0, 2)$

$y = 3x + 2$

$2 = 3(0) + 2$

$2 = 0 + 2$

$2 = 2 \checkmark$

$6x - 2y = -4$

$6(0) - 2(2) = 4$

$0 - 4 = -4$

$-4 = -4 \checkmark$

$a + 5b = -3 \Rightarrow a = -3-5b$

$3a - 2b = 8$

$a + 5b = -3$

$a + 5(-1) = -3$

$a + -5 = -3$

$\quad +5 \quad +5$

$\boxed{a = 2}$

$3a - 2b = 8$

$3(-3-5b) - 2b = 8$

$-9 - 15b - 2b = 8$

$-9 - 17b = 8$

$+9 \qquad\qquad +9$

$\dfrac{-17b}{-17} = \dfrac{17}{-17}$

$\boxed{b = -1}$

intersecting.

consistent t
indep.

Solu: $(2, -1)$

$$8x + 2y = 13$$
$$4x + y = 11 \Rightarrow y = 11 - 4x$$

parallel lines

inconsistent

$$8x + 2y = 13$$
$$8x + 2(11 - 4x) = 13$$
$$8x + 22 - 8x = 13$$
$$22 \neq 13$$
False
no solu.

$\frac{y}{2} = \frac{1}{2}y$ 3x - 2y = 11

x + y/2 = 4 $\Rightarrow$ x = 4 - $\frac{y}{2}$

$3x - 2y = 11$

$3\left(4 - \frac{y}{2}\right) - 2y = 11$

$12 - \frac{3}{2}y - \frac{7}{2}y = 11$

$12 - \frac{7}{2}y = 11 \quad _{-12}$

-12

_____

$\left(-\frac{2}{7}\right) -\frac{7}{2}y = -1 \left(-\frac{2}{7}\right)$

$\boxed{y = \frac{2}{7}}$

$-\frac{3}{2} - \frac{2}{1}y$

$-\frac{3}{2} \div \frac{4}{2} = \frac{-7}{2}$

Intersecting
const. &
indep.

Solu: $\left(3^{6/7}, \frac{2}{7}\right)$

$3x - 2y = 11$

$3x - 2\left(\frac{2}{7}\right) = 11$

$3x - \frac{4}{7} = 11$

$\quad +\frac{4}{7} \quad +\frac{4}{7}$

$\frac{3x}{3} = 11^{4/7} \text{ or } \frac{81}{7} \bigg/ \frac{3}{1}$

$x = \frac{81}{21} = 3^{18/21}$

$\boxed{x = 3^{6/7}}$

or $\frac{27}{7}$

HW: pg. 379 #16-22 (even) 26, 28

how many solu?

Solu?

Check