# Announcement:

Quiz on Thursday 4/12 over sections 7.1, 7.2, 7.3, 7.4 (solving linear systems)

- graphing
- substitution
- adding/subtracting (elimination)

# Homework review (7.2):

④

$$y = 2x - 1$$

$$2x + y = 3$$

$$\boxed{(1, 1)}$$

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

$$y = 1$$

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

$$2x + 2x - 1 = 3$$
$$\phantom{2x + 2x} +1 \quad +1$$

$$\frac{4x}{4} = \frac{4}{4}$$

$$x = 1$$

$$1 = 2(1) - 1$$
$$1 = 2 - 1$$
$$1 = 1 \checkmark$$

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

$$2x + y = 9$$
$$4x - y = -15$$

$$(-1, 11)$$

$$2(-1) + y = 9$$
$$-2 + y = 9$$
$$+2 \qquad +2$$
$$y = 11$$

$$2x + y = 9$$
$$-2x \qquad -2x$$
$$y = \boxed{-2x + 9}$$

$$4x + (-2x + 9) = -15$$
$$4x + 2x - 9 = -15$$
$$6x \quad +9 \quad +9$$
$$\frac{6x}{6} = \frac{-6}{6}$$
$$x = -1$$

$$4x - 7y = 10$$

$$y = x - 7$$

$$(13, 6)$$

$$y = 13 - 7$$
$$= 6$$

$$4x + -7(x - 7) = 10$$

$$4x + -7x + 49 = 10$$
$$\phantom{4x + -7x} -49 \quad -49$$

$$\frac{-3x}{-3} = \frac{-39}{-3}$$

$$x = 13$$

$$4(13) - 7(6) = 10$$

$$52 - 42 = 10$$

$$\checkmark \ 10 = 10$$

$$-5x + 3y = 51$$

$$y = 10x - 8$$

$$(3, 22)$$

$$y = 10(3) - 8$$

$$y = 30 - 8$$

$$y = 22$$

$$-5x + 3(10x - 8) = 51$$

$$-5x + 30x - 24 = 51$$

$$\phantom{-5x + 30x} +24 \quad +24$$

$$\frac{25x}{25} = \frac{75}{25}$$

$$x = 3$$

# Ways to Solve Linear Systems:

Quick – but not very accurate

Graphing and estimating...

Really accurate – but can take a while

Substitution...

Intermediate difficulty – but you can't always use it

Adding/subtracting... (Elimination)

# Adding or subtracting to solve linear systems:
### (Elimination)

$$4x + 3y = 2 \qquad 5x + 3y = -2$$

$$(5x + 3y) = (-2)$$

$$-x = 4$$
$$\overline{-1} \quad \overline{-1}$$
$$x = -4$$

$$\begin{array}{ccc} 4x & 3y & 2 \\ -5x & -3y & +2 \\ \hline x & 0 & 4 \end{array}$$

$$4(-4) + 3y = 2$$
$$-16 + 3y = 2$$
$$+16 \qquad +16$$
$$\frac{3y}{3} = \frac{18}{3}$$
$$y = 6$$

**Step 1:** Rewrite equations to line up variable terms, constant, and equals sign (not necessary if both equations are already in the exact same form...)

**Step 2:** Add or subtract the equations to eliminate one variable

**Step 3:** Solve the resulting equation for the isolated variable

**Step 4:** Substitute the value you just found into either original equation to find the value of the other variable

$$(-4, 6)$$

**Step 5:** Verify your work!

When can you add different expressions
to both sides of an equation?

$x + 5 = 7$          If ...

$+a$   $+b$          $a = b$

$+z$   $+2$          $z = 2$

$+y$   $+3x + 7$     $y = 3x + 7$

$\boxed{x = 2}$   $x + 5 = 7$

$+4$   $+4$

$x + 9 = 11$

$-3$   $-3$

$x + 6 = 8$

$+ z$   $+ 12$

$x + z + 6 = 20$
         $-6$   $-6$

$x + z = 14$

$2 + z = 14$
$-2$        $-2$

$\boxed{z = 12}$

8

## ADD:                 SUBTRACT:

$$7x + 2y = 4$$
$$-5x + 6y = 10$$
$$+ \overline{\phantom{-5x + 6y = 10}}$$
$$2x + 8y = 14$$

$$4y = 2x + 3$$
$$-y = 3x + 9$$
$$+ \overline{\phantom{-y = 3x + 9}}$$
$$3y = 5x + 12$$

$$4y = 2x + 3 \qquad\qquad -x = 5y + 6$$
$$-2x \; -4y \quad -2x \; -4y$$
$$-2x = -4y + 3 \quad \leftarrow \text{reverse coefficients and add}$$
$$+ \quad x = -5y - 6$$
$$\overline{\phantom{+ \quad x = -5y - 6}}$$
$$-x = -9y - 3$$

$$-x = 2y + 62 \qquad -\left( 2x + 2y = -4 \right)$$
$$+\left( -2x = +2y + 4 \right) \qquad -2y \quad -2y$$
$$\overline{\phantom{+\left( -2x = +2y + 4 \right)}} \qquad 2x = -2y - 4$$
$$-3x = 4y + 66$$

# Solve a Linear System:

$$2x + 3y = 7 \qquad -3x = -3y + 3$$

$$+ \left( +3x + 3y = 3 \right) \qquad +3y \quad +3y$$

$$-3x + 3y = 3$$

$$\frac{5x}{5} = \frac{4}{5}$$

$$x = \frac{4}{5}$$

$$2\left(\frac{4}{5}\right) + 3y = 7$$

$$5\left( \frac{8}{5} + 3y \right) = 7 \cdot 5$$

$$8 + 15y = 35$$
$$-8 \qquad\qquad -8$$

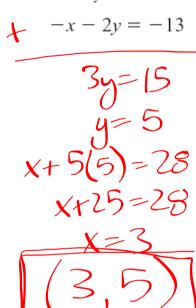$$\frac{15y}{15} = \frac{27}{15}$$

$$y = \frac{27}{15} = \boxed{\frac{9}{5}}$$

**Step 1...** Rearrange the equations $(x, y, =, cons)$

**Step 2...** Add or subtract the two equations

**Step 3...** Solve the resulting equation

**Step 4...** Plug that variable in to either equation and solve

**Solve the linear system by using elimination.** And verify your results.

**10.** $x + 5y = 28$

$+\quad -x - 2y = -13$

$3y = 15$

$y = 5$

$x + 5(5) = 28$

$x + 25 = 28$

$x = 3$

$\boxed{(3, 5)}$

**11.** $7x - 4y = -30$

$+\quad 3x + 4y = 10$

$\dfrac{10x}{10} = \dfrac{-20}{10}$

$x = -2$

$7(-2) - 4y = -30$

$-14 - 4y = -30$

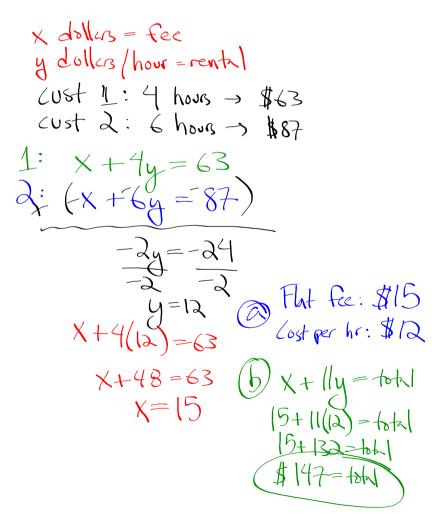$\dfrac{-4y}{-4} = \dfrac{-16}{-4}$

$y = 4$

$(-2, 4)$

**12.** $6x + y = 39$

$-2x + y = -17$

**Floor Sander Rental** A rental company charges a flat fee of $x$ dollars for a floor sander rental plus $y$ dollars per hour of the rental. One customer rents a floor sander for 4 hours and pays $63. Another customer rents a floor sander for 6 hours and pays $87.

**a.** Find the flat fee and the cost per hour for the rental.

**b.** How much would it cost someone to rent a sander for 11 hours?

$$x \text{ dollars} = \text{fee}$$
$$y \text{ dollars}/\text{hour} = \text{rental}$$

$$\text{Cust } \underline{1}: 4 \text{ hours} \rightarrow \$63$$
$$\text{Cust } 2: 6 \text{ hours} \rightarrow \$87$$

$$1: \quad x + 4y = 63$$
$$2: \quad (-x + {}^-6y = {}^-87)$$
$$\overline{\phantom{xxxxxxxxxx}}$$
$$\frac{-2y}{-2} = \frac{-24}{-2}$$
$$y = 12$$

$$x + 4(12) = 63$$
$$x + 48 = 63$$
$$x = 15$$

ⓐ Flat fee: $15
Cost per hr: $12

ⓑ $x + 11y = \text{total}$
$$15 + 11(12) = \text{total}$$
$$15 + 132 = \text{total}$$
$$\boxed{\$147 = \text{total}}$$

Homework:

p. 447: 3-30 (every 3rd), 40