Unit 2 Test Study Guide
Linear Functions & Systems

Name: _____

Date: _____

Topic 1: Relations & Functions

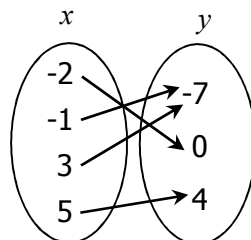**Find the domain and range of each relation. Then determine if the relation is a function.**

1.

x	y
5	5
6	6
7	7
8	8

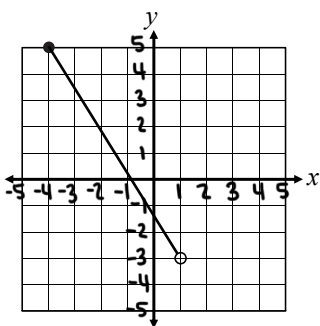$D = \{5,6,7,8\}$

$R = \{5,6,7,8\}$

Function? yes

2.

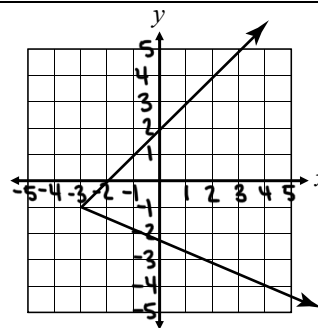$D = \{-2,-1,3,5\}$

$R = \{-7,0,4\}$

Function? yes

3.

$D = [-4,1)$ $R = (-3,5]$

Function? yes

4.

$D = [-3,\infty)$ $R = (-\infty,\infty)$

Function? No

Use $f(x) = -4x + 1$, $g(x) = x^2 - 8x + 21$, and $h(x) = |9 - 3x|$ for questions 5 – 10.

5. Find $g(-5)$

$g(-5) = (-5)^2 - 8(-5) + 21$
$= 25 + 40 + 21$
$= 65 + 21$
$= \boxed{86}$

6. Find $f\left(\dfrac{11}{12}\right) = -4\left(\frac{11}{12}\right) + 1$

$= -\frac{11}{3} + \frac{3}{3}$

$= \boxed{-\frac{8}{3}}$

7. Find $h(8) - f(-7)$

$h(8) = |9 - 3(8)| = |9 - 24| = |-15| = 15$
$f(-7) = -4(-7) + 1 = 28 + 1 = 29$

$h(8) - f(-7) = 15 - 29 = \boxed{-14}$

8. Find $g(x + 4)$

$g(x+4) = (x+4)^2 - 8(x+4) + 21$
$= x^2 + 8x + 16 - 8x - 32 + 21$
$= \boxed{x^2 + 5}$

9. If $f(x) = 53$, find x.

$53 = -4x + 1$
$\underline{-1 \qquad -1}$
$\dfrac{52}{-4} = \dfrac{-4x}{-4}$

$\boxed{x = -13}$

10. If $h(x) = 39$, find x.

$39 = |9 - 3x|$

$9 - 3x = 39 \qquad 9 - 3x = -39$
$\underline{-9 \qquad -9} \qquad \underline{-9 \qquad -9}$
$\dfrac{-3x}{-3} = \dfrac{30}{-3} \qquad \dfrac{-3x}{-3} = \dfrac{-48}{-3}$
$x = -10 \qquad\qquad x = 16$

check:
$39 \overset{?}{=} |9 - 3(-10)|$
$39 \overset{?}{=} |9 + 30|$
$39 = 39 \checkmark$
$39 \overset{?}{=} |9 - 3(16)|$
$39 \overset{?}{=} |9 - 48|$
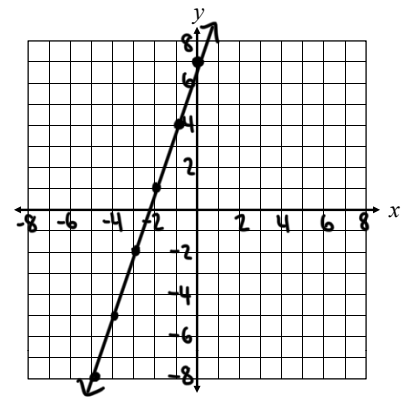$39 \overset{?}{=} |-39|$
$39 = 39 \checkmark$

$x = \{-10, 16\}$

Topic 2: Linear Equations: Slope-Intercept & Standard Form

Write each equation in SLOPE-INTERCEPT FORM, then graph the line.

11 $4x - 5y = -10$

$$\underline{-4x \qquad -4x}$$

$$\frac{-5y}{-5} = \frac{-4x}{-5} \frac{-10}{-5}$$

$$y = \frac{4}{5}x + 2$$
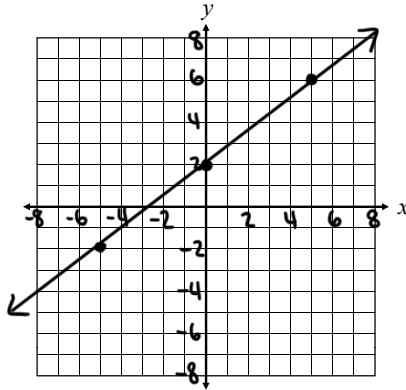
12. $12x = 4y - 28$

$$\underline{+28 \qquad +28}$$

$$\frac{12x + 28}{4} = \frac{4y}{4}$$

$$\frac{12x}{4} \quad \frac{28}{4} \quad \frac{4y}{4}$$

$$3x + 7 = y$$

$$y = 3x + 7$$

Give an example of a line that is parallel and a line that is perpendicular to each given line.

13. $9x + 6y = -6$

$$\underline{-9x \qquad -9x}$$

$$\frac{6y}{6} = \frac{-9x}{6} \frac{-6}{6}$$

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

Parallel: $y = -\frac{3}{2}x + 8$

Perpendicular: $y = \frac{2}{3}x - 5$

14. $y = -5$

Parallel: $y = 2$

Perpendicular: $x = -3$

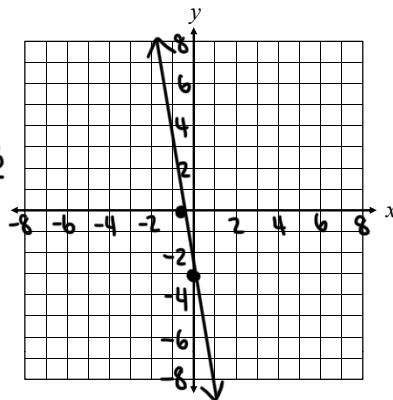## Find the *x*- and *y*-interepts of each line, then graph the line.

15. $y = -5x - 3$

y-int: $(0, -3)$

x-int: $0 = -5x - 3$

$$\underline{+3 \qquad +3}$$

$$\frac{3}{-5} = \frac{-5x}{-5}$$

$$x = -\frac{3}{5}$$

$$\left(-\frac{3}{5}, 0\right)$$

16. $4y = 10x - 24$

y-int: $4y = 10(0) - 24$

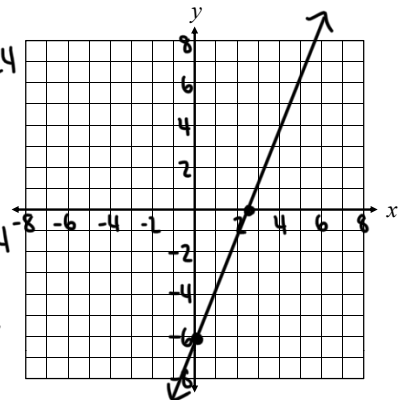$$\frac{4y}{4} = \frac{-24}{4}$$

$$(0, -6) \quad y = -6$$

x-int: $4(0) = 10x - 24$

$$0 = 10x - 24$$

$$\underline{+24 \qquad +24}$$

$$\frac{24}{10} = \frac{10x}{10}$$

$$\left(\frac{12}{5}, 0\right) \quad x = \frac{12}{5}$$

Topic 3: Writing Linear Equations & Applications

Write the equation in SLOPE-INTERCEPT FORM with the given information.

17. Passes through (-8, 3) with a slope of -2

$$y - 3 = -2(x - (-8))$$

$$y - 3 = -2(x + 8)$$

$$y - 3 = -2x - 16$$

$$\underline{+3 \qquad \quad +3}$$

$$\boxed{y = -2x - 13}$$

18. Passes through (-7, -3) and (5, 6)

$$m = \frac{6 - (-3)}{5 - (-7)} = \frac{9}{12} = \frac{3}{4}$$

$$y - 6 = \frac{3}{4}(x - 5)$$

$$y - 6 = \frac{3}{4}x - \frac{15}{4}$$

$$y - \frac{24}{4} = \frac{3}{4}x - \frac{15}{4}$$

$$\underline{+\frac{24}{4} \qquad \quad +\frac{24}{4}}$$

$$\boxed{y = \frac{3}{4}x + \frac{9}{4}}$$

Topic 4: Systems of Equations

19. $x - 2y = 8$ (Solve by Graphing)	**20.** $3y - 6 = 4x$ (Solve by Graphing)

19. $x - 2y = 8$ (Solve by Graphing)
  $6x - y = -7$

$$X - 2y = 8$$
$$-X \qquad -X$$
$$\frac{-2y}{-2} = \frac{-X + 8}{-2 \;\; -2}$$
$$y = \tfrac{1}{2}X - 4$$

$$6X - y = -7$$
$$-6X \qquad -6X$$
$$\frac{-y}{-1} = \frac{-6X - 7}{-1 \;\; -1}$$
$$y = 6X + 7$$

$(-2, -5)$
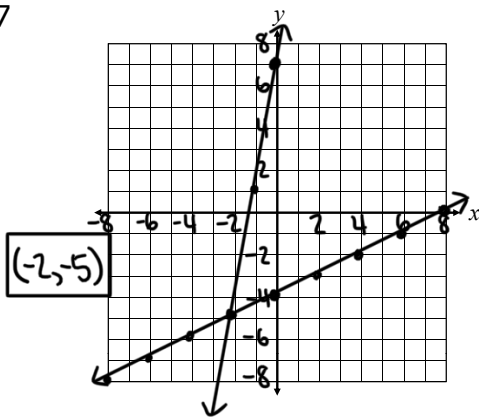
20. $3y - 6 = 4x$ (Solve by Graphing)
  $16x + 24 = 12y$

$$3y - 6 = 4x$$
$$+6 \quad +6$$
$$\frac{3y}{3} = \frac{4X + 6}{3 \;\; 3}$$
$$y = \tfrac{4}{3}X + 2$$

$$\frac{16X + 24}{12} = \frac{12y}{12 \;\; 12}$$ same line
$$y = \tfrac{4}{3}X + 2$$

infinite solutions

---

21. $5x - 4y = 9$
  $(x + 7y = -6)(-5)$

$$5X - 4y = 9$$
$$-5X - 35y = 30$$
$$\frac{-39y}{-39} = \frac{39}{-39}$$
$$y = -1$$

$$X + 7(-1) = -6$$
$$X - 7 = -6$$
$$+7 \quad +7$$
$$X = 1$$

$(1, -1)$

22. $2x + 3y = -35$
  $(8x - y = -23)(3)$

$$2X + 3y = -35$$
$$24X - 3y = -69$$
$$\frac{26X}{26} = \frac{-104}{26}$$
$$X = -4$$

$$8(-4) - y = -23$$
$$-32 - y = -23$$
$$+32 \qquad +32$$
$$\frac{-y}{-1} = \frac{9}{-1}$$
$$y = -9$$

$(-4, -9)$

---

23. $3x + 10 = 14y$
  $8x - 7y = 34$

$$\frac{3X + 10}{14} = \frac{14y}{14 \;\; 14}$$
$$y = \tfrac{3}{14}X + \tfrac{5}{7}$$
$$3(6) + 10 = 14y$$
$$18 + 10 = 14y$$
$$\frac{28}{14} = \frac{14y}{14}$$
$$y = 2$$

$$8X - 7\left(\tfrac{3}{14}X + \tfrac{5}{7}\right) = 34$$
$$2(8X - \tfrac{3}{2}X - 5) = (34)2$$
$$16X - 3X - 10 = 68$$
$$13X - 10 = 68$$
$$+10 \quad +10$$
$$\frac{13X}{13} = \frac{78}{13}$$
$$X = 6$$

$(6, 2)$

29. $18x = 12y + 7$
  $-8y + 21 = -12x$

$$\frac{18X}{18} = \frac{12y + 7}{18 \;\; 18}$$
$$X = \tfrac{2}{3}y + \tfrac{7}{18}$$

$$-8y + 21 = -12\left(\tfrac{2}{3}y + \tfrac{7}{18}\right)$$
$$-8y + 21 = -8y - \tfrac{14}{3}$$
$$+8y \qquad +8y$$
$$21 \neq -\tfrac{14}{3}$$

No Solution

---

25. Ben has a collection of quarters and nickels worth $5.35. If the number of nickels is five less than twice the number of quarters, find the number of each coin.

Let q = # of quarters
  n = # of nickels

$$100(0.25q + 0.05n) = (5.35)100$$
$$25q + 5n = 535$$
$$25q + 5(2q - 5) = 535$$
$$25q + 10q - 25 = 535$$
$$+25 \qquad +25$$
$$\frac{35q}{35} = \frac{560}{35}$$
$$q = 16$$

$$n = 2q - 5$$
$$n = 2(16) - 5$$
$$n = 32 - 5$$
$$n = 27$$

Ben has 16 quarters and 27 nickels.

26. Aliyah bought four composition notebooks and three packs of pencils from the school bookstore and paid $10.93. Laura bought seven composition notebooks and two packs of pencils and paid $13.31. If each pencil pack contains ten pencils, what is the unit price per pencil?

Let n = price per notebook
p = price per pack of pencils

$2(4n + 3p = 10.93)$ $(7n + 2p = 13.31)(-3)$

$8n + 6p = 21.86$
$-21n - 6p = -39.93$
────────────
$-13n = -18.07$
$\overline{-13} \quad \overline{-13}$
$n = 1.39$

$4(1.39) + 3p = 10.93$
$5.56 + 3p = 10.93$
$-5.56 \qquad -5.56$
────────────
$\frac{3p}{3} = \frac{5.37}{3}$
$p = 1.79$

Each pack of pencils costs $1.79, so each pencil would be about 18¢.

Topic 5: Linear Inequalities & Systems of Linear Inequalities

Show the solution to each linear inequality and system of linear inequalites by graphing.
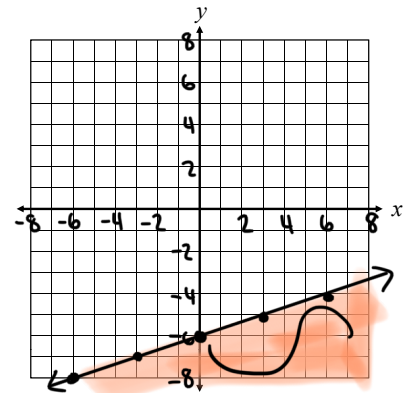
27. $y > -\dfrac{7}{2}x + 3$
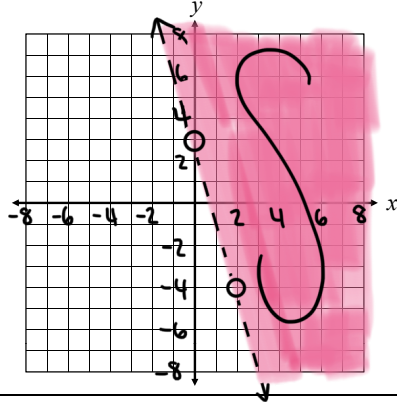
28. $2x - 6y \geq 36$
$-2x \qquad -2x$
────────────
$\dfrac{-6y}{-6} \geq \dfrac{-2x}{-6} + \dfrac{36}{-6}$
$y \leq \frac{1}{3}x - 6$

29. $5x - 2y > -8$
$\quad y \leq -3$
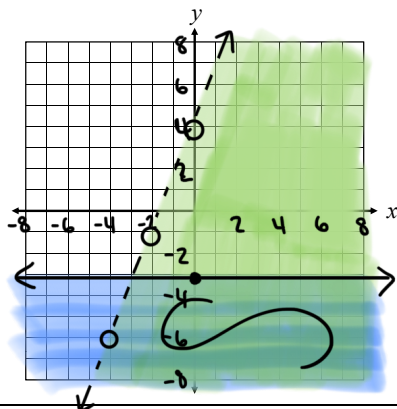
$5x - 2y > -8$
$-5x \qquad -5x$
────────────
$\dfrac{-2y}{-2} > \dfrac{-5x}{-2} - \dfrac{8}{-2}$
$y < \frac{5}{2}x + 4$

30. $x - y \leq 4$
$\quad 3y \geq 3x + 9$

$x - y \leq 4$
$-x \qquad -x$
────────────
$\dfrac{-y}{-1} \leq \dfrac{-x}{-1} + \dfrac{4}{-1}$
$y \geq x - 4$

$\dfrac{3y}{3} \geq \dfrac{3x}{3} + \dfrac{9}{3}$
$y \geq x + 3$
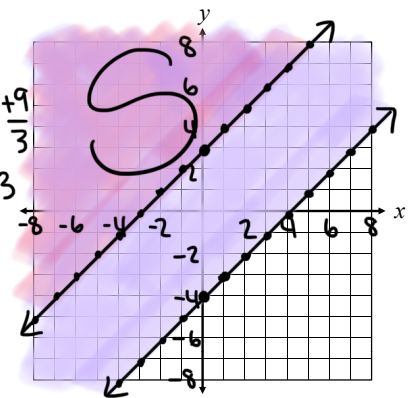
Topic 6: Solving Systems with 3-Variables

31. Solve the system below using your method of choice:

$$4x + 2y - 5z = 47$$
$$x - 2y + 6z = -10$$
$$9x - 7y - z = 75$$

$$4x + 2y - 5z = 47$$
$$-45x + 35y + 5z = -375$$
$$\overline{-41x + 37y = -328}$$

$$-41x + 37\left(\tfrac{5}{4}x - 10\right) = -328$$
$$-41x + \tfrac{185}{4}x - 370 = -328$$
$$ +370 \quad +370$$

$$\overline{4\left(-41x + \tfrac{185}{4}x\right) = (42)4}$$
$$-164x + 185x = 168$$
$$\frac{21x}{21} = \frac{168}{21}$$
$$X = 8$$

$$x - 2y + 6z = -10$$
$$54x - 42y - 6z = 450$$
$$\overline{\frac{55x}{11} - \frac{44y}{11} = \frac{440}{11}}$$

$$5x - 4y = 40$$
$$-5x \qquad -5x$$
$$\overline{\frac{-4y}{-4} = \frac{-5x}{-4} + \frac{40}{-4}}$$
$$y = \tfrac{5}{4}x - 10$$
$$y = \tfrac{5}{4}(8) - 10$$
$$y = 10 - 10$$
$$y = 0$$

$$9(8) - 7(0) - z = 75$$
$$72 - z = 75$$
$$-72 \qquad -72$$
$$\overline{\frac{-z}{-1} = \frac{3}{-1}}$$
$$z = -3$$

$$\boxed{(8, 0, -3)}$$