Name:_____Previous Math Teachers:_____&_____

Answer KEY: ~~HONORS~~ Regular **ADVANCED ALGEBRA W/ TRIG SUMMER PACKET** (CHAPTERS ~~1-3~~ 1-2)

You can access a set of teacher notes as well as textbook notes/pages from the PDF files attached to the Lane Tech website, which may prove helpful as you are working through these sets of problems.

You may also find the following website a helpful resource: https://www.khanacademy.org/

YOU MUST SHOW ALL WORK IN ORDER TO RECEIVE FULL CREDIT! BOX YOUR ANSWERS!

CHAPTER 1

Lesson (1.1)- Apply Properties of Real Numbers/ Unit Conversions **CCSS: A.SSE.1**

Perform the indicated conversion.

1.) 20 mi/hr to feet/second

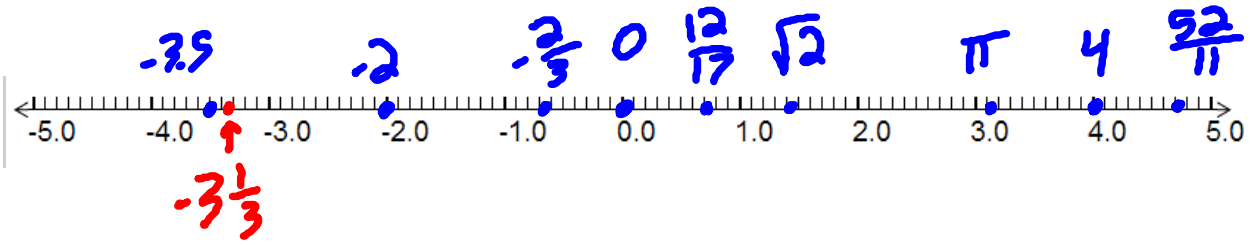
$$20\frac{miles}{hour} * \frac{5280}{1}\frac{ft}{mi} * \frac{1}{3600}\frac{hour}{sec} = \quad \mathbf{\frac{88}{3}\ or\ 29.33\frac{feet}{sec}}$$

2.) **Given the set of numbers below, answer the following questions.**

$$\sqrt{2}, \quad \pi, \quad -\frac{2}{3}, \quad -2, \quad \frac{12}{17}, \quad -3.5, \quad \frac{52}{11}, \quad 4, \quad 0, \quad -3\frac{1}{3}$$

a.) List the numbers in order from least to greatest and plot them on the given number line.

$$-3.5, \quad -3\frac{1}{3}, \quad -2, \quad -\frac{2}{3}, \quad 0, \quad \frac{12}{17}, \quad \sqrt{2}, \quad \pi, \quad 4, \quad \frac{52}{11}$$



b.) Given that Real Numbers can be defined as rational, irrational, integers, whole numbers and natural numbers, list all the sets of real numbers that each of the numbers above belong to.

$$natural: 4, \quad whole: 4, 0, \quad integers: -2, 0, 4,$$

$$Rational: -\frac{2}{3}, -2, \frac{12}{17}, -3.5, \frac{52}{11}, 4, 0, -3\frac{1}{3}, \quad irrational: \sqrt{2}, \pi$$

c.) If each number is increased by 5, does list from least to greatest change? Why or why not?

No. Each number increases by ("adds") 5, which preserves the order of the numbers. Effectively, each number slides 5 units to the right on the number line.

d.) If each number is multiplied by -5, does list from least to greatest change? Why or why not?

Yes, the order of the numbers would reverse in this case. Multiplying by a negative number reverses the relationship order. $1 < 4, \quad but \quad 1(-3) \not< 4(-3), \; because \; -3 > -12$

Lesson (1.2) – Evaluate and Simplify Algebraic Expressions. **CCSS: A.SSE.1**

Evaluate the expression.

3.) -2^4

$\mathbf{-16}$

4.) $(-2)^4$

$\mathbf{16}$

5.) $-3x^2 + (3y)^4 \; when \; x = \; -5, \; y = 1$

$$-3(-5)^2 + (3 * 1)^4 = -3(25) + 3^4$$
$$= -75 + 81 = 6$$

Lesson (1.3) – Solve Linear Equations **CCSS: A.REI.1, A.REI.3**

Solve the following equation.

6.) $\frac{2}{3}(x - 3) + 6 = \frac{1}{6}(4x + 24)$

$$\frac{2}{3}x - 2 + 6 = \frac{2}{3}x + \frac{24}{6}$$
$$\frac{2}{3}x + 4 = \frac{2}{3}x + 4$$
$$\frac{2}{3}x = \frac{2}{3}x$$
$$x = x$$

Solution: All Real #s $(\mathbb{R})$

Set up an equation and solve for the following situation.

7.) Your rectangular lawn has an area of 288 square feet. You want to border the lawn with a white picket fence. The lawn is twice as long as it is wide. How much fencing do you need?

$$width = w, \qquad length = 2w$$
$$Area = 288 = w * 2w$$
$$2w^2 = 288 \rightarrow \; w^2 = 144 \rightarrow w = \pm 12$$

As a width, only 12 feet (not -12) makes sense, so the dimensions of the lawn are 12 ft by 24 ft.

Fencing = perimeter of that rectangle.

$$perim = 2l + 2w = 2(24) + 2(12) = 72 \; feet \; of \; fencing$$

Lesson (1.4) – Rewrite formulas and Equations **CCSS: A.CED.1**

Solve the formula for the indicated variable. Then use the given information to find the value of the variable. Include Units of measure in the answer.

8.) Lateral Surface Area of a Right Circular Cone.

a.) Solve for R: $S = \pi s(R + r)$

$$\frac{S}{\pi s} = R + r$$
$$\frac{S}{\pi s} - r = R$$

$\mathbf{R = \frac{S}{\pi s} - r}$ **or** $\mathbf{R = \frac{S - \pi r s}{\pi s}}$

9.) Surface area of a right circular cylinder.

a.) Solve for h: $S = 2\pi r^2 + 2\pi r h$

$$S - 2\pi r^2 = 2\pi r h$$
$$\frac{S - 2\pi r^2}{2\pi r} = h$$

$\mathbf{h = \frac{S - 2\pi r^2}{2\pi r}}$ **or** $\mathbf{h = \frac{S}{2\pi r} - r}$

b.) Find R when S = 355 cm^2, s = 10 cm, and r = 3 cm

$$R = \frac{355}{\pi(10)} - 3 \approx 8.3\ cm$$

b.) Find h when S = 102 ft^2 and r = 2 ft

$$h = \frac{102}{2\pi(2)} - 2 = 6.1169\ ft$$

Lesson (1.6) – Solve Linear Inequalities / Use of Interval Notation **CCSS: A.CED.3, A.REI.3**

For the following inequalities:

10.) $2 < 3x - 1 \leq 6$

a.) Solve the following inequality algebraically.

$$3 < 3x \leq 7$$
$$1 < x \leq \frac{7}{3}$$

b.) Graph the solution with 2 key values

c.) Write the solution in interval notation.

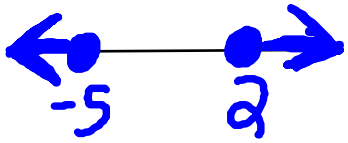
$$\left(1, \frac{7}{3}\right]$$

11.) $-x - 4 \geq 1$ or $2 - 5x \leq -8$

a.) Solve the following inequality algebraically.

$$-x \geq 5 \quad or \quad -5x \leq -10$$
$$x \leq -5 \quad or \quad x \geq 2$$

b.) Graph the solution with two key values



c.) Write the solution in interval notation.

~~$(-\infty, -5) \cup (2, \infty)$~~

$(-\infty, -5] \cup [2, \infty)$

12.) $2(x - 4) > 2x + 1$

a.) Solve the following inequality algebraically.

$$2x - 8 > 2x + 1$$
$$-8 > 1$$

Which is never true

b.) Does the inequality have (circle one):

i.) no solution

ii.) all real numbers

13.) $4x - 5 \leq 4(x + 2)$

a.) Solve the following inequality algebraically.

$$4x - 5 \leq 4x + 8$$
$$-5 \leq 8$$

Which is always true

b.) Does the inequality have (circle one):

i.) no solution

ii.) all real numbers

Lesson (1.7) – Solve Absolute Value Equations and Inequalities **CCSS: A.CED.3**

Solve the following absolute value equations/inequalities. If necessary, check for extraneous solutions & label. Use interval notation for the inequalities.

14.) $|3x-4|=10$ 15.) $|x+24|=-7x$ 16.) $\left|\frac{1}{3}x+4\right|\geq 13$ 17) $\frac{1}{2}|3x-6|+2<7$

14. $3x-4=10 \quad or \quad 3x-4=-10$

$3x=14 \quad or \quad 3x=-6$

$x=\frac{14}{3} \quad or \quad x=-2$

15. $x+24=-7x \quad or \quad x+24=7x$

$24=-8x \quad or \quad 24=6x$

$-3=x \quad or \quad 4=x$

(apparent solutions)

Check in original:

$|-3+24|=-7(-3)$

$|21|=21$

Which is true, so $x=-3$ is valid

$|4+24|=-7(4)$

$|28|=-28$

Which is not true, so $x=4$ is extraneous, and $x=-3$ is the only valid solution.

$x=-3 \qquad x\neq 4$

16. $\frac{1}{3}x+4\geq 13 \quad or \quad \frac{1}{3}x+4\leq -13$

$\frac{1}{3}x\geq 9 \quad or \quad \frac{1}{3}x\leq -17$

$x\geq 27 \quad or \quad x\leq -51$

Interval: $(-\infty,-51]\cup[27,\infty)$

17. $\frac{1}{2}|3x-6|<5$

$|3x-6|<10$

$3x-6<10 \quad and \quad 3x-6>-10$

$3x<16 \quad and \quad 3x>-4$

$x<\frac{16}{3} \quad and \quad x>-\frac{4}{3}$

$-\frac{4}{3}<x<\frac{16}{3}$

Interval: $\left(-\frac{4}{3},\frac{16}{3}\right)$

CHAPTER 2

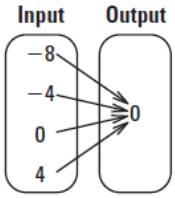
Lesson (2.1) – Represent relations and graph functions; explain whether the relation is a function or not; identify input and output as domain and range (interval notation) **CCSS: F.IF.1, F.IF.4, A.CED.3**

18.) Identify the domain and range of the given relation. Explain if the relation is a function. Why or why not?

(- 1, -1), (2, 5), (4, 8), (- 5, - 9)(-1, - 5)

Domain: {-5, -1, 2, 4}
Range: {-9, -5, -1, 5, 8}
Not a function, because the input of -1 goes to two different outputs.

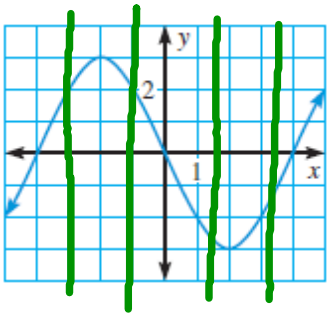
19.) Tell whether or not the following relation is a function Explain if the relation is a function. Why or why not?



This relation *is* a function, because each input goes to exactly one output.

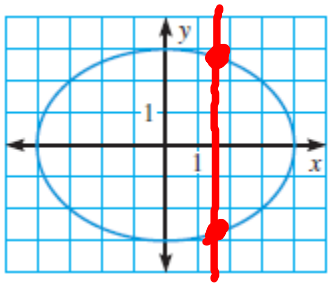
20.) According to page 73 in the attached textbook notes, (section 2.1), reference the VERTICAL LINE TEST. Using the vertical line test, determine whether or not the following relations are functions.

a.)



This ***is*** a function. Passes the vertical line test.

b.)



This ***is NOT*** a function. It fails the vertical line test (at least one vertical line touches the graph in more than one place).

Lesson (2.2) - Find Slope and Rate of Change **CCSS: A.CED.2, A. REI. 11**

21.) Tell whether the lines are *parallel*, *perpendicular*, or *neither*.

a.) Line 1: through (3, -1) and (6, -4)
Line 2: through (-4, 5) and (-2, 7)

Line 1's slope is -1.
Line 2's slope is 1.
The slopes are opposite reciprocals, so the lines are perpendicular (⊥)

b.) Line 1: through (-3, 2) and (5, 0)
Line 2: through (-7, -2) and (-4, -1)

Line 1's slope is -1/4.
Line 2's slope is 1/3.
The lines are neither parallel nor perpendicular, because the slopes are neither identical nor opposite reciprocals.

22.) Find the value of k so that the line through the given points has the given slope.

a.) (2, -3) and (k, 7); m = -2

$k = -3$

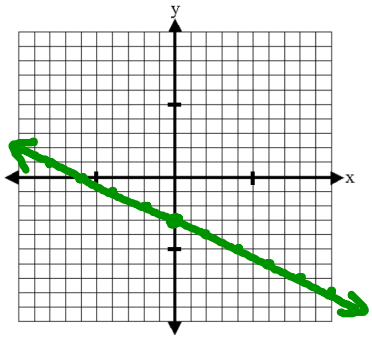
b.) (0, k) and (3, 4); m = 1

$k = 1$

Lesson (2.3) - Graph Linear Equations **CCSS: A.CED.2, A.REI.11, F.IF.1, F.IF.2, F.IF.4**

23.) Graph the following equations:

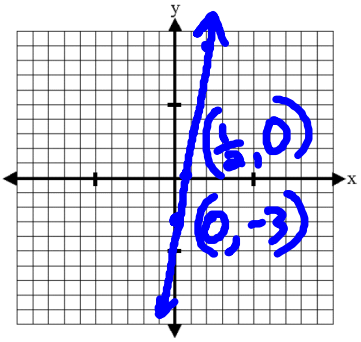
a.) Using slope intercept form, graph $x + 2y = -6$



$2y = -x - 6$

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

b.) Use the x and y intercept to graph $6x - y = 3$



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

Lesson (2.4) - Writing Equations of Lines **CCSS: A.CED.1**

24.) Write the equation of the line that passes through the given point and has the given slope.

a.) (0, -2); m = 4

$y = 4x - 2$

$y + 2 = 4(x - 0)$

b.) (-5, -6), m = 0

Slope 0 → line is horizontal.

$y = -6$

25.) Write the equation of the line that passes through the given point and satisfies the given condition.

a.) (2, 8); parallel to y = 3x – 2

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

$y = 3x + 2$

b.) (-6, 2); perpendicular to y = - 2

Perpendicular to a horizontal line ($y = -2$),
Line must be vertical, so equation

$x = something$

$x = -6$

26.) Write the equation of the line in STANDARD, POINT-SLOPE, and SLOPE-INTERCEPT FORM that passes through the points: (0, 7) & (3, 5) .

STANDARD FORM: _____ $2x + 3y = 21$ **(I did this one last)**

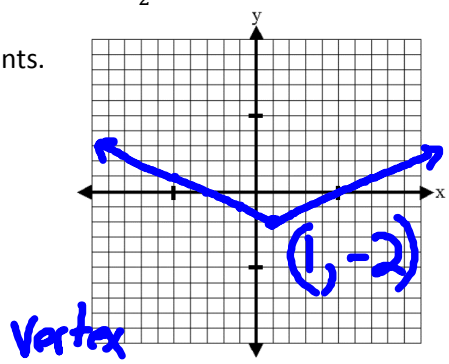
POINT SLOPE FORM:_____ $y - 5 = -\frac{2}{3}(x - 3)$ *or* $y - 7 = -\frac{2}{3}(x)$

SLOPE INTERCEPT FORM:_____ $y = -\frac{2}{3}x + 7$

Lesson (2.7) - Objective: Graph of Absolute Value Equation; Emphasize "h" "k" & "a" **CCSS: A.CED.3**

27.) Graph the function: $y = \frac{1}{2}|x - 1| - 2$

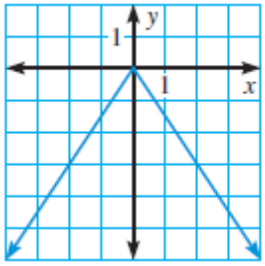
Include the vertex and four other points.



(-5, 1)
(-3, 0)
(-1, -1)
(1, -2)
(3, -1)
(5, 0)
(7, 1)

$a = \frac{1}{2}, h = 1, k = -2$

28.) Write an equation of the graph below.



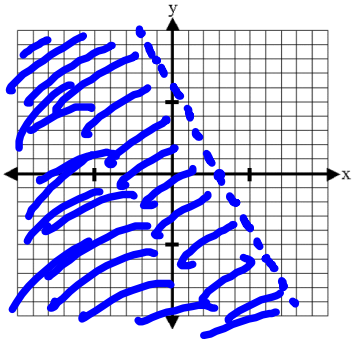
$a = -\frac{3}{2}, h = 0, k = 0$

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

Lesson (2.8) - Graph Linear equalities **CCSS: A.CED.2, A.REI.12, F.IF.4**

Graph the given inequality in a coordinate plane.

29.) 2x + y < 6



$y < -2x + 6$

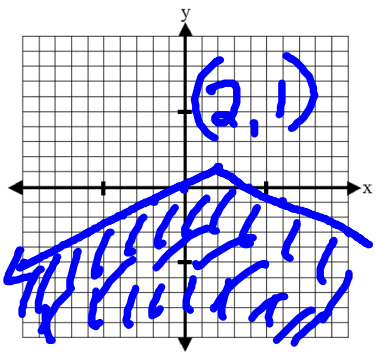
(dashed line, shade below)

30.) $y \leq -\frac{1}{2}|x - 2| + 1$

$a = -\frac{1}{2}$

$h = 2$

$k = 1$



(solid V shape, shade below)