ALGEBRA II
SUMMER REVIEW PACKET

Name ______________________________

All students going into Algebra 2 in the fall are expected to have a solid understanding of the topics covered in this packet. This includes topics covered in Algebra 1 and Geometry. It is highly suggested that students spend some time completing these problems over the summer to ensure they enter Algebra 2 with these concepts.

We will review the concepts contained in this packet during the first few days of class. Following this review, students will be assessed on the material covered in this packet. The assessment will be graded for accuracy and will be part of the first marking period grade.

Students may use online resources such as Khan Academy Videos (www.khanacademy.com) to assist in learning the topics that they are finding difficult. Video links have been placed throughout the text for additional help with each topic.

Section I: Vocabulary

Fill in each blank with the correct term. Pick a word or expression from the list provided.

irrational	function	x-intercept
coefficient	quadratic	y-intercept
factor	rational	range
	domain	

1. A number that multiplies a variable or variables in an expression is called a ______________ .
2. Each expression that is multiplied together to form a product is called a ______________________ .
3. A _________________ expression is a polynomial with the highest exponent of 2.
4. The set of ______________ numbers contains any number that can be written as a ratio of two integers.
5. Any number that cannot be written as a fraction and does not have a terminating or repeating decimal is a _____________________________ .
6. A special relation where each input has exactly one output is called a ___________________ .
7. The _________________________ represents the point on the vertical axis and also describes the initial amount of a function.
8. Any coordinate pair that has a y-coordinate of zero represents a(n) ________________________ of the graph.
9. The ______________________ of a function is the set of possible x-values or inputs for the function.
10. The ______________________ of a function is the set of possible y-values or outputs for the function.

Section II: Solving Multi-Step Equations

Steps for solving multi-step equations

1. Simplify each side of the equation first. To do this, you may want to eliminate fractions or decimals, combine like terms, or use the distributive property to eliminate parenthesis.
2. Get all variables on one side and all numbers on the other side.
3. Isolate the variable using an inverse operation.

Solving for a Variable

Solving for a single variable is just like solving an equation, by isolating the variable you are solving for using inverse operations. Remember your answer will have other variables in it.

Use these videos as a resource if you need to review these topics:

Solving a Multi-step Equation Example Problem: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-solving-equations/cc-8th-equations-distribution/v/equation-special-cases

Eliminating Fractions: https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-solving-equations/cc-8th-equations-distribution/v/solving-equations-with-the-distributive-property-2

Solving for a Variable Example Problem: https://www.khanacademy.org/math/algebra/solving-linear-equations-and-inequalities/solving_for_variable/v/solving-for-a-variable

Directions: Solve the following equations. Check your solutions.

11. $9 - \frac{4}{5}(u - 3) = 1$

12. $-\frac{3}{2}(d - 2) = 21$

13. $4(a + 2) = 14 - 2(3 - 2a)$

14. $2(g - 2) - 4 = 2(g - 3)$

15. $2x + \frac{2}{3}(4 - x) = \frac{1}{6}(4x + 5) + \frac{9}{2}$

16. $\frac{5}{2}t - t = 3 + \frac{3}{2}t$

Directions: Solve each equation for the given variable:

17. Solve for y: $3x - 4y = 24$

18. Solve for *t*: $A = P + \Pr t$

Section III: Functions

Function Vocabulary

Relation – A relation is a pairing of inputs and outputs and is often represented as a set of points (x, y).

Domain – the set of x-values in a given relation, also known as the inputs.

Range – the set of y-values in a given relation, also known as the outputs.

Function – a special relation where each input has exactly one output.

Vertical Line Test – states that if you can draw a vertical line through more than one point on a given graph, then the relation is not a function.

Examples: (a) Given the relation {(6, 5), (4,3), (6, 4), (5, 8)}

Domain: {4, 5, 6}   Range: {3, 4, 5, 8}

This relation is not a function because the input 6 has two outputs, 4 and 5

(b) Given the relation $\{(1,1),(2,-3),(3,0),(4,1)\}$

Domain: {1, 2, 3, 4}   Range: {-3, 0, 1}

This relation is a function because every input has exactly one output.

Use these videos as a resource if you need to review these topics:
Functions *https://www.khanacademy.org/math/algebra/algebra-functions*

Directions: Determine the Domain and Range of each relation. Then state whether the relation is a function.

19. $\{(-4,6),(3,6),(7,-9),(8,1)\}$

Domain: ______________

Range: ______________

Function? ______________

20. $\{(-4,6),(3,8),(6,4),(3,-9),(5,7)\}$

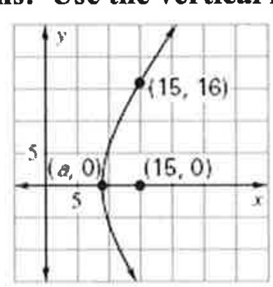
Domain: ______________

Range: ______________

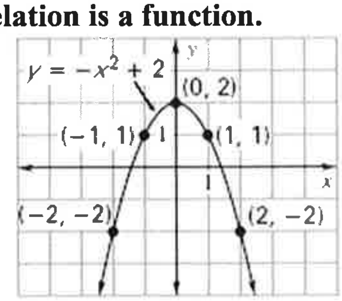
Function? ______________

Directions: Use the vertical line test to determine if each relation is a function.

21.



22.



Directions: Evaluate the function at the given value.

23. If $f(x) = -x^2 - 2x + 7$, evaluate $f(1)$.

24. If $f(x) = 5x^2 - 5x + 7$, evaluate $f\left(\frac{1}{2}\right)$.

25. If $f(x) = x^2 - 3x + 2$, evaluate $f(-3)$.

26. If $f(x) = -5x + 11$ *and* $f(n) = 21$, find the value of n.

Directions: Find the domain and range of the functions represented by the graphs below.

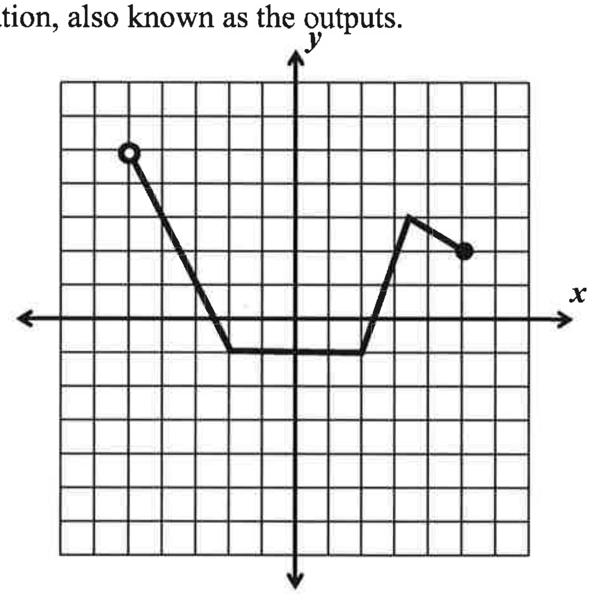
Remember… the domain is the set of x-values in a given relation, also known as the inputs.

and the range is the set of y-values in a given relation, also known as the outputs.

27. Fill in the blanks to identify the domain and range of the graph.

Domain: ______ $< x \leq$ ______

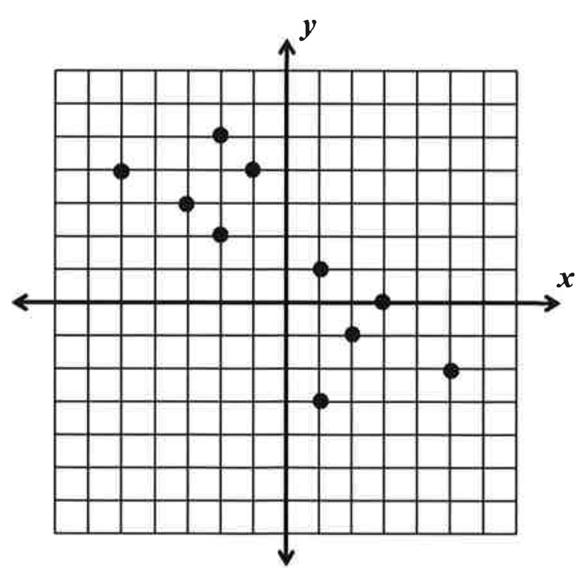
Range: ______ $\leq y <$ ______



28. Find the domain and range of the graph to the right.

Domain : ______________________________

Range: ______________________________



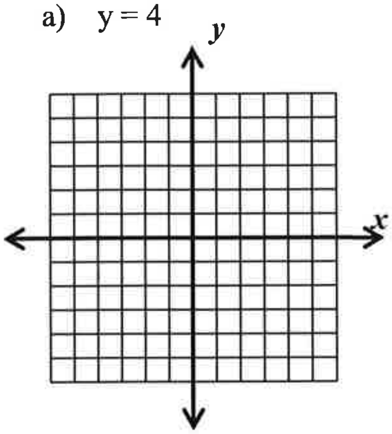
Section IV: Linear Functions

Three Forms of a Linear Equation	Slope
Standard Form: $ax + by = c$	Given two points: $m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope-Intercept Form: $y = mx + b$	Graphically $slope = \frac{rise}{run}$
Point-Slope Form: $(y - y_1) = m(x - x_1)$	
Need additional help? Check out videos here → https://www.khanacademy.org/math/algebra/two-var-linear-equations	

29. What is a linear function?

30. Graph the following, list the domain and range and determine which one is a function:

a) y = 4

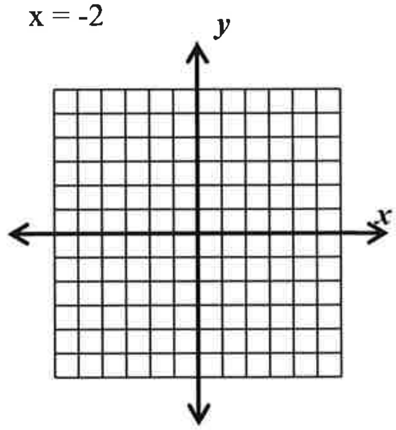


Function? ________

Domain: ________

Range: ________

b) x = -2

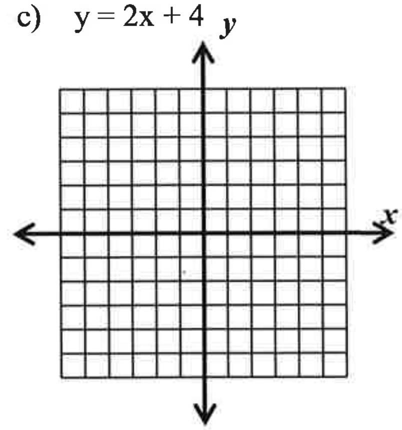


Function? ________

Domain: ________

Range: ________

c) y = 2x + 4



Function? ________

Domain: ________

Range: ________

31. Find the equation of a line that contains the points (5, -1) and (7, -2).

32. Transform $y = \frac{2}{3}x - 4$ in standard form.

33. Use point-slope form to find the equation of a line in standard form with slope = ¼ and point (8, -2) and give your answer in standard form.

34. Find the equation of a line that generates the following data :

x	y
2	8
3	12
4	16
5	20

35. Give the equation of a horizontal line that contains the point (-3, 5).

36. Give the equation of a vertical line that contains the point (-3, 5).

37. Find the slope of the line with the following equations:

a) $4x - 5y = 12$ b) $y = 7$ c) $x = 0$

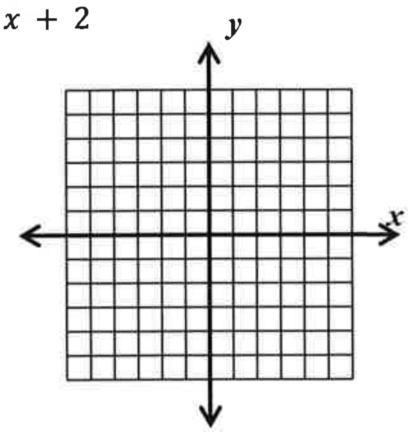
38. Write an equation of a line in standard form that has a slope of $\frac{5}{4}$.

39. Find the equation of a line that is parallel to $2x - 5y = 11$ and contains the point (7, 9).

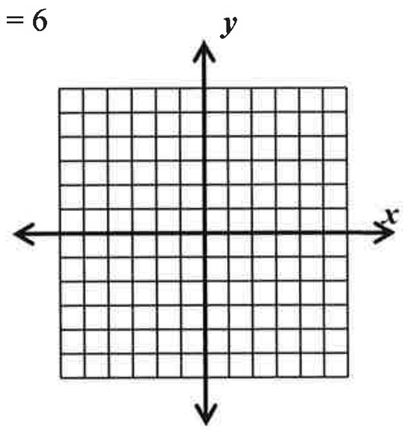
40. Find the equation of a line that is perpendicular to $y = \frac{5}{4}x + 4$ that contains the point (-6, 5).

41. Graph the equations

a) $y = \frac{-2}{3}x + 2$

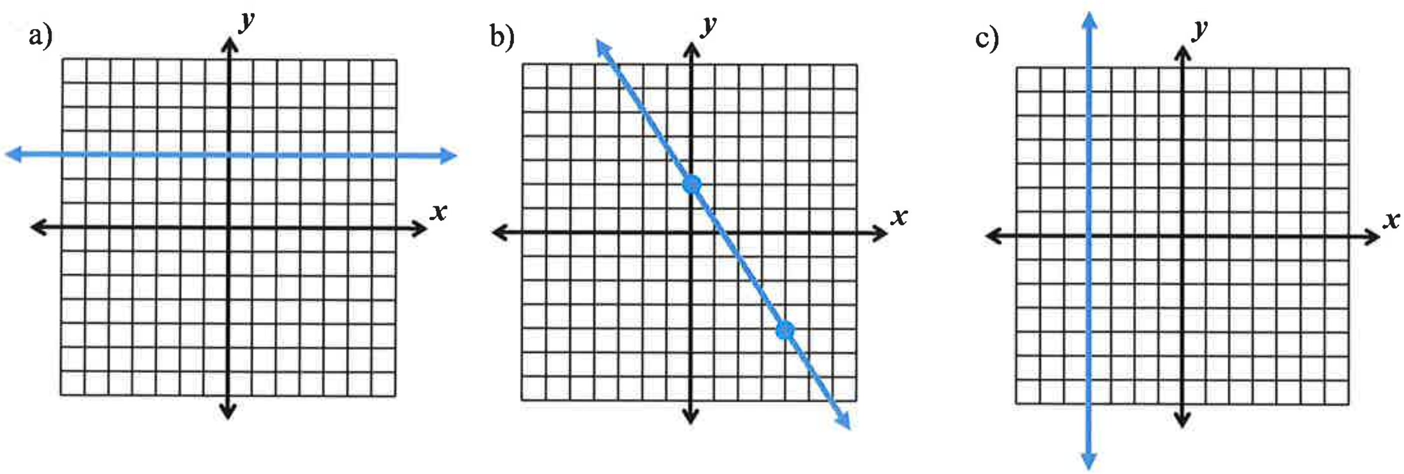


b) $9x - 3y = 6$



42. John left his equation in point slope form and got $y + 3 = 4(x - 2)$. What are the coordinates of the point and slope that he used to write the equation?

43. What are the equations of the lines graphed?



Section V: Quadratic Functions

The **vertex form** of a quadratic equation is $y = (x-h)^2 + k$.

- The vertex of this parabola is (h, k).
- The axis of symmetry is x = h

The **standard form** of a quadratic equation is $y = ax^2 + bx + c = 0$.

- The axis of symmetry is $x = \frac{-b}{2a}$

Additional help → https://www.khanacademy.org/math/algebra/quadratics#features-of-quadratic-functions

44. Identify the vertex and axis of symmetry given the quadratic equation: $y = -x^2 - 8x - 15$.

45. Identify the vertex and axis of symmetry of the parabola given by the equation: $y = 5(x-2)^2 + 6$

The following websites may be helpful for factoring.

https://www.khanacademy.org/math/algebra/multiplying-factoring-expression/factoring-special-products/e/factoring_difference_of_squares_1

https://www.youtube.com/watch?v=AMEau9OE6Bs

46. Factor $x^2 - 3x - 10$

47. Factor $3x^2 + 10x - 8$

48. Factor $x^2 - 100$

49. Factor $x^2 + 5x - 24$

The **discriminant** of a quadratic equation is $d = b^2 - 4ac$.

To determine the number of solutions:

$d > 0 \rightarrow$ two real solutions

$d = 0 \rightarrow$ one real solution

$d < 0 \rightarrow$ no real solutions

50. Find the discriminant and determine how many real solutions the equation has: $3x^2 + 2x - 1 = 0$

51. Find the discriminant and determine how many real solutions the equation has: $x^2 - 5x + 1 = -3x$

Quadratic Formula: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For more on solving quadratic equations, you may visit the following web-site.

https://www.khanacademy.org/math/algebra/quadratics/quadratics-square-root/v/solving-quadratic-equations-by-square-roots

52. Solve $9x^2 - 4 = 0$.

53. Solve $8x^2 - 6x + 1 = 0$.

Section VI: Properties of Exponents

Fundamental Properties of Exponents

Let a *and* b *be real numbers, and let* m *and* n *be integers:*

Zero Exponent Property: $a^0 = 1 \;\; if\; a \neq 0$

Negative Exponent Property: $a^{-m} = \frac{1}{a^m} \;\; if\; a \neq 0$

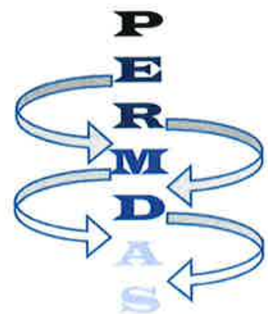
Product of Powers Property: $a^m \cdot a^n = a^{m+n}$

Quotient of Powers Property: $\frac{a^m}{a^n} = a^{m-n}$

Power of a Product Property: $(ab)^m = a^m b^m$

Power of a Quotient Property: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m} \;\; if\; b \neq 0$

Power of a Power Property: $(a^m)^n = a^{mn}$



1. How does the exponent work with the base value?
2. Why must negative bases be written within parentheses for the exponent to apply correctly?
3. How can Order of Operations guide shortcuts to applying the properties?

Applying Properties of Exponents

Remember that bases must be the same in order to apply the properties. Simplifying exponential expressions can be done when the expressions are being multiplied, divided, powered or rooted. ***Never*** **attempt to apply exponential properties involving addition or subtraction of terms!!** This will violate order of operations!

Use these videos as a resource if you need to review these topics:
Exponent Properties 1: https://www.youtube.com/watch?v=8htcZca0JIA

Exponent Properties 2: https://www.youtube.com/watch?v=1Nt-t9YJM8k

True or False: Write "true" if the statement is true. If the statement is false, write "false" and correct the statement so that it becomes true. Assume all variables represent non-zero real numbers.

54. $x^0 = 1$ ________________ ________________

55. $x \cdot x^5 = x^6$ ________________ ________________

56. $\frac{x^5}{x^{10}} = x^{\frac{1}{2}}$ ________________ ________________

57. $\left(x^6\right)^2 = x^{36}$ ________________ ________________

58. $5^{-2} = -25$ ________________ ________________

Tell whether the number is positive or negative before simplifying. Then simplify the numerical expression.

59. -2^4 ____________________ ___________

60. $(-2)^4$ ____________________ ___________

61. $-(-7)^5$ ____________________ ___________

62. $(-9)^3$ ____________________ ___________

Simplify and evaluate each power:

63. $(3x)^{-4}$

64. $-25x^6 \cdot 8x^{-4}$

65. $\left(\frac{x}{4}\right)^3$

66. $\frac{2x^8}{(2x^{-2})^4}$

67. $\frac{5x(3x^3)^2}{18x^4}$

68. $(x^{-4} \cdot y^6)^{-2}$

Section VII: Radical Expressions

Simplifying and Rationalizing of Radicals:

Part #1: Simplifying Radicals

In math, when we ask for an "**exact answer**," this means that your answer MAY include a radical sign.

Example: $\sqrt{7}$ is an ***exact*** answer

2.645751311 (which the calculator gives you when you enter $\sqrt{7}$) is **NOT EXACT**. It is rounded to whatever fits on your calculator screen

- When we simplify radicals we try to factor out the LARGEST perfect square factor possible.

Perfect Squares: 0, 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400

Examples:

$\sqrt{40} = \sqrt{4} * \sqrt{10} = 2\sqrt{10}$ $\sqrt{160} = \sqrt{16} * \sqrt{10} = 4\sqrt{10}$

Part #2: Simplifying Radicals

No radicals in the denominator of a fraction.

- You can **NOT** have a radical in the denominator of a fraction that cannot be simplified because it is an irrational number. So you have to "**RATIONALIZE**" it to make it "normal" or RATIONAL.

Examples:

$\frac{2}{\sqrt{5}} \frac{*\sqrt{5}}{*\sqrt{5}} = \frac{2\sqrt{5}}{5}$ $\frac{3}{2\sqrt{7}} \frac{*\sqrt{7}}{*\sqrt{7}} = \frac{3\sqrt{7}}{2(7)} = \frac{3\sqrt{7}}{14}$

Part 1: Simplify each radical below:

69. $\sqrt{24}$

70. $\sqrt{200}$

71. $\sqrt{180}$

72. $\sqrt{50x^2}$

73. $\sqrt{98k}$

74. $\sqrt{16x^3y}$

Part 2: Simplify completely by rationalizing the denominator.

75. $\frac{16}{\sqrt{2}} =$

76. $\frac{9}{\sqrt{3}} =$

77. $\frac{12}{\sqrt{3}} =$

78. $\frac{31}{\sqrt{17}} =$

79. $\frac{30}{\sqrt{6}} =$

80. $\frac{70}{\sqrt{7}} =$