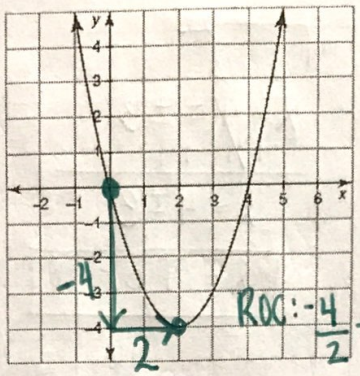
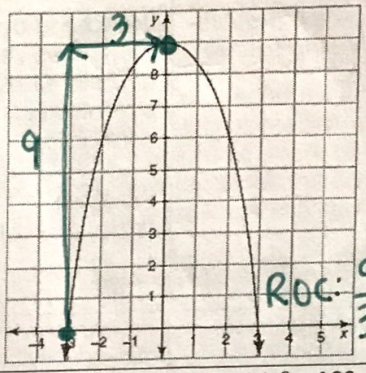
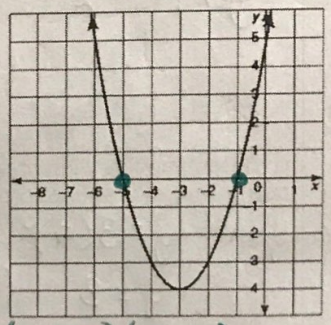
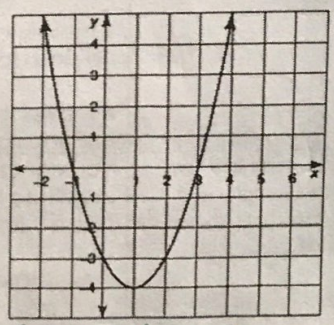
Algebra 1
Cumulative Exam #2 Review Guide (Units 8.3, 9.1, 10.1, & 11.1)

Name: Key
Date: _____ Period: _____

What you need to know & be able to do	Things to remember	Examples
1. *Find the average rate of change given a graph*	-Determine your two x-values and find their corresponding y-values on the parabola. -Calculate the rate of change (rise over run)	a. On interval from $0 \le x \le 2$:  ROC: $\frac{-4}{2} = -2$ b. On interval from $-3 \le x \le 0$:  ROC: $\frac{9}{3} = 3$
2. *Applications of the Vertex*	Maximum/Minimum indicate finding the vertex. Interpret the vertex in terms of what x and y represent.	a. The height in feet of a rocket after x second is given by $y = -16x^2 + 128x$. What is the maximum height reached by the rocket and how long does it take to reach that height? $x = \frac{-b}{2a} = \frac{-128}{2(-16)} = \frac{-128}{-32} = 4$ seconds $y = -16(4)^2 + 128(4) = 256$ ft
3. *Determine the equation of a parabola using its zeros.*	The zeros and factors in the equation have opposite signs.	a. Create an equation, in factored form, to represent the following graph.  Y = $(x+5)(x+1)$ b. Create an equation, in factored form, to represent the following graph.  Y = $(x+1)(x-3)$
4. *Solve Quadratic Equations*	Solve by Factoring or Quadratic Formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	a. Solve for x: $x^2 - 9x + 20 = 0$ $(x-4)(x-5) = 0$ $x = 4$ and $x = 5$ b. Solve for x: $x^2 - 13x + 47 = 7$ $-7 \quad -7$ $x^2 - 13x + 40 = 0$ $(x-8)(x-5) = 0$ $x = 8$ and $x = 5$

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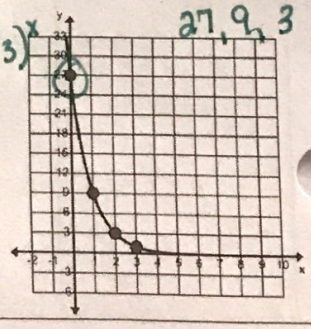
5. *Completing the Square*	Move the c term to the right side Use $\left(\frac{b}{2}\right)^2$ to complete the square and then apply square root method	a. What would be the missing number in line 2 if solving by completing the square? $\frac{4}{2}=(2)^2=4$ $x^2 + 4x + 11 = 10$ $x^2 + 4x + \underline{4} = -1 + \underline{4}$	b. What would be the missing number in line 2 if solving by completing the square? $\frac{-16}{2}=(-8)^2$ $x^2 - 16x + 52 = 0$ $x^2 - 16x + \underline{64} = -52 + \underline{64}$
6. *Solve equations by finding square roots.*	Use solving by square roots when your equations have parenthesis or two terms (a & c). PEMDAS (backwards)	a. $\sqrt{(x-4)^2} = \sqrt{9}$ $x - 4 = \pm 3$ $+4 \quad +4$ $x = 4 \pm 3$ **x = 7 or 1**	b. $2(x+3)^2 + 2 = 34$ $-2 \quad -2$ $\frac{2(x+3)^2}{2} = \frac{32}{2}$ $\sqrt{(x+3)^2} = \sqrt{16}$ $x + 3 = \pm 4$ $-3 \quad -3$ $x = -3 \pm 4$ **x = 1 or -7**
7. *Solving literal equations*	Remember you "literally" write what you see. Think about how you will undo the square term.	a. Solve for r: $A = \pi r^2$ $\frac{A}{\pi} = \frac{\pi r^2}{\pi}$ $\sqrt{\frac{A}{\pi}} = \sqrt{r^2}$ $r = \sqrt{\frac{A}{\pi}}$	b. Solve for s: $V = \frac{1}{3}s^2 h$ $3V = s^2 h$ $\frac{3V}{h} = \frac{s^2 h}{h}$ $\sqrt{s^2} = \sqrt{\frac{3V}{h}}$ $s = \sqrt{\frac{3V}{h}}$
8. Describe the transformations of an exponential function.	$f(x) = a(b)^{x-h} + k$ **a** stretches or shrinks AND/OR reflects **k** moves the function up and down. **h** moves the function left and right.	a. Given the function $g(x) = 2^x$, write a new equation after a transformation of right 9 and reflect across the x-axis. $g(x) = -2^{x-9}$	b. Describe the transformation $h(x) = 10^x$ to $k(x) = 4(10)^{x+1} - 5$. • stretch by 4 • left 1 • down 5
9. Determine the y-intercept and asymptote from an equation	You can always substitute 0 in for x to find a y-intercept Asymptote: y = k No 'k' value, the asymptote is y = 0.	a. Determine the y-intercept and asymptote of the function $y = 3(2)^x$. y-int: $y = 3(2)^0$ $y = 3 \quad (0, 3)$ asymptote: $y = 0$	b. Determine the y-intercept and asymptote of the function $y = 4(\frac{1}{2})^x - 2$. y-int: $y = 4(\frac{1}{2})^0 - 2$ $y = 2 \quad (0, 2)$ asymptote: $y = -2$
10. Create equations from a graph or table	y = y-int(constant ratio)^x	a. x: -2, -1, 0, 1, 2, 3 y: $\frac{1}{9}$, $\frac{1}{3}$, 1, 3, 9, 27 x3 x3 $y = 1(3)^n$	b. $y = 27(\frac{1}{3})^x$  27, 9, 3

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11. Determine the growth/decay factor and rate.	(1 + r) and (1 − r) represent the growth and decay factors Rate is just the r value	a. $y = 3(1.25)^x$ Growth Determine if the function is growth or decay: Factor: 1.25 Rate: 25% 100 + ___ = 125	b. $y = 2(.84)^x$ Decay Determine if the function is growth or decay: Factor: .84 Rate: 16% 100 − ___ = 84
12. Applications of exponential functions.	Growth: $y = a(1 + r)^t$ Decay: $y = a(1 − r)^t$ a: initial amount t: time r: Growth/Decay rate	a. A certain radioactive element decays at a rate of 21% per month. If the starting amount was 32 ounces, how much will be left after **1 year**? Model: $y = 32(.79)^t$ $y = 32(.79)^{12}$ Solution: 1.89 ounces	b. The value of the Barbie Dream House is $125,000. This house is in a prime location and appreciates (increases in value) at a rate of 7% per year. How much will the Barbie Dream House be worth in 5 years? Model: $y = 125{,}000(1.07)^t$ $y = 125{,}000(1.07)^5$ Solution: $175,318.97
13. Arithmetic & Geometric Sequences	**Arithmetic:** Explicit: $a_n = a_1 + (n-1)d$ Recursive: $a_1 =$ ___ $a_n = a_{n-1} + d$ **Geometric:** Explicit: $a_n = a_1 \cdot r^{n-1}$ Recursive: $a_1 =$ ___ $a_n = r(a_{n-1})$ You must always know your first term and the constant ratio/common difference to write an explicit formula!	a. Create an explicit and recursive formula for the following: -4, -9, -14, -19... $a_n = -4 - 5(n-1)$ OR $a_n = -5n + 1$ $a_1 = -4$ $a_n = a_{n-1} - 5$	b. Create an explicit and recursive formula for the following: 81, 27, 9, 3, ... $a_n = 81(1/3)^{n-1}$ $a_1 = 81$ $a_n = 1/3(a_{n-1})$
		c. Determine the 9th term in the sequence: 5, 15, 45, ... Geometric ×3 $a_n = 5(3)^{n-1}$ $a_9 = 5(3)^{9-1}$ $a_9 = 32{,}805$	d. Given the sequence -3, 0, 3, 6... find the 32nd term. Arithmetic $a_n = -3 + 3(n-1)$ OR $a_n = 3n - 6$ $a_{32} = 3(32) - 6$ $a_{32} = 90$
		e. Determine the first five terms of the sequence: $a_n = -2 \cdot 3^{n-1}$ $-2, -6, -18, -54, -162, \ldots$	f. Determine the first five terms of the sequence: $a_1 = 6$ $a_n = \frac{1}{2}(a_{n-1})$ $6, 3, 1.5, .75, .375, \ldots$

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g. Determine the first five terms of the sequence: $a_1 = 7$

$a_n = a_{n-1} - 3$

7, 4, 1, -2, -5...

h. Determine the first five terms of the sequence: $a_n = -5n + 2$.

1	2	3	4	5
-3	-8	-13	-18	-23

i. Write the explicit formula given the following arithmetic sequence:

$a_4 = 6$ and $a_5 = 2$

1	2	3	4	5
18	14	10	6	2

-4

$a_n = 18 - 4(n-1)$

or

$a_n = -4n + 22$

j. Write the explicit formula given the following geometric sequence:

$a_3 = -18$ and $a_4 = -54$

1	2	3	4
-2	-6	-18	-54

×3

$a_n = -2(3)^{n-1}$

14. Sequence Applications

a. The table shows a car's value for 3 years after it is purchased.

a. Does this table form an arithmetic or geometric sequence? Explain how you know.

Decay

Geometric because you are multiplying by 0.85

Year	Value ($)
1	18,000
2	15,300
3	13,005

b. Create an explicit formula to represent the table.

$\frac{18000}{15300} = 1.18$ ~~1.18~~

$\frac{15300}{18000} = .85$

$a_n = 18{,}000(.85)^{n-1}$

c. How much is the car worth after 8 years?

$a_8 = 18000(.85)^{8-1}$

$a_8 = \$5770$

You will also have five questions on the exam over content from before Units 3 – 7 to begin preparing you for the EOC. We covered the following topics:

- Creating algebraic expressions, equations, and inequalities
- Solving an equation
- Solving an inequality
- Determining if a graph, table, set of points, or mapping was a function
- Graphing linear functions
- Writing equations of line
- Finding the slope and y-intercept
- Describe the characteristics of a linear function
- Solving systems of equations using substitution or elimination
- Solve a real world system of equations
- Graph a system of equations and inequalities
- Perform operations of addition, subtraction, and multiplication on polynomials
- Factoring polynomials

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