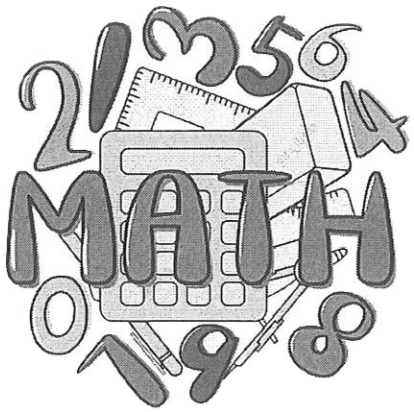
Name: Key Date: PD:

ALGEBRA 2 HN
SUMMER PRACTICE
2024



This is **NOT for a grade!**

This will **NOT be collected**

We **highly recommend completing this packet to set yourself up strong for the 24-25 SY**

An answer key is/will be posted on the KJMS website.

Purpose: This summer practice assignment was created in conjunction with KJMS and FHS teachers to:

- ★ communicate to each student what is expected to know prior to entering Algebra 2.
  - o The topics in this assignment were taught in previous math courses.
- ★ provide an opportunity for students to practice those skills and concepts necessary for success in Algebra 2.

Please note: The decision to take an Honors class is a serious one. The work in this class will require:

- Exemplary work habits.
- Exemplary time management skills.
- Ability to keep up with a rigorous and fast paced course
- A genuine desire to learn.
- Personal responsibility with attendance, work requirements, and seeking help.
- Self-discipline and determination to succeed.

Calculator Information:

You will be using graphing calculators throughout the course, ***HOWEVER,*** students should not have a reliance on calculators. **Students should be able to complete ALL problems in this packet without the use of a calculator.**

At Fairfax High School, Desmos is NOT a tool that is used.

If you do not own a graphing calculator it is recommended that you purchase your own calculator. It is recommended purchasing a TI-84.

Students entering Algebra 2 are expected to know –

- ☐ **Topic 1:** Long division
- ☐ **Topic 2:** Fraction skills and numeracy
- ☐ **Topic 3:** Solve multi-step linear equations.
- ☐ **Topic 4:** Solve and graph multi-step linear inequalities.
- ☐ **Topic 5:** Graphing linear equations
- ☐ **Topic 6:** Identifying the x- and y- intercepts algebraically
- ☐ **Topic 7:** Write equations of lines in slope-intercept or standard form given
  - Two points
  - The x- and y- intercepts
  - Slope and one point
  - A point and the equation of a line parallel
  - A point and the equation of a line perpendicular
  - A graph
- ☐ **Topic 8:** Solve systems of linear equations in two variables using elimination and substitution methods.
- ☐ **Topic 9:** Graphing linear inequalities and systems of linear inequalities.
- ☐ **Topic 10:** Simplify polynomial expressions (add, subtract, and multiply)
- ☐ **Topic 11:** Simplifying polynomials (dividing)
- ☐ **Topic 12:** Operations with Exponents
- ☐ **Topic 13:** Factor polynomial expressions.
- ☐ **Topic 14:** Solve quadratic equations using square roots and factoring.
- ☐ **Topic 15:** Quadratic Formula
- ☐ **Topic 16:** Simplify radical expressions (add, subtract, multiply, and divide radicals), including rationalizing the denominator.
- ☐ **Topic 17:** Characteristics of Quadratic Functions

Important information to memorize:

- ★ Quadratic Formula
- ★ Perfect Squares up to 20, and Cubes up to 10
- ★ Square and Cube Roots

These skills will be incorporated into the Algebra 2 course throughout the school year.

There are no secrets to success. It is the result of preparation, hard work, and learning from failure.

- Colin Powell

Topic 1: Long Division

Solve each problem using long division. If necessary, continue dividing until the hundred thousandths.

$3759 \div 14$	$64152 \div 216$
268.5	297

Topic 2: Fraction Skills and Numeracy

Solve each equation. Leave your answers as BOTH simplified improper fractions and mixed numbers.

$\frac{7}{8} + \frac{3}{4}$	$\frac{11}{4} + \frac{23}{18}$	$2\frac{13}{35} - 1\frac{5}{14}$
$\frac{13}{8}$ OR $1\frac{5}{8}$	$\frac{155}{36}$ OR $4\frac{11}{36}$	$\frac{71}{70}$ OR $1\frac{1}{70}$
$3\frac{5}{8} - 2\frac{7}{8}$	$\frac{10}{11} \times 1\frac{7}{15}$	$18 \times 1\frac{3}{7} \times \frac{4}{15}$
$\frac{3}{4}$	$\frac{4}{3}$ OR $1\frac{1}{3}$	$\frac{48}{7}$ OR $6\frac{6}{7}$

$2\frac{1}{4} \div 3$ $\frac{3}{4}$	$4\frac{1}{2} \div 1\frac{3}{4}$ $\frac{18}{7}$ OR $2\frac{4}{7}$	A father leaves his money to his four children. The first received $\frac{1}{3}$, the second received $\frac{1}{6}$, and the third received $\frac{2}{5}$. How much did the remaining child receive? $\frac{1}{10}$

Topic 3: Solve multi-step linear equations

Solve for x in each equation. Write your answers as improper fractions if necessary.

$2(x + 9) - (3x - 4) = -5(2x - 3)$ $x = \frac{-7}{9}$	$6(7 - 2y) = 3(5y + 1)$ $y = \frac{13}{9}$	$4 + 3y = \frac{1}{3}(9y + 12)$ $x \in \mathbb{R}$ all real #s
$x - \frac{c}{2} = -\frac{3c}{2}$ $x = -c$	$t = \frac{pd}{2x}$ $x = \frac{Pd}{2t}$	$c + ax = dx$ $x = \frac{-c}{a-d}$ OR $x = \frac{c}{d-a}$

$|3x + 19| = 13$

$X = -2$
OR
$X = \frac{-32}{3}$

$7 - |4x + 1| = -2$

$X = 2$ OR
$X = \frac{-5}{2}$

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

$X = -30$
OR
$X = 70$

$\frac{3x+5}{4} - \frac{x-7}{5} = 1$

$X = -3$

$\frac{x}{3} + 1 = \frac{5x}{6} - 3$

$X = 8$

$\frac{41}{9} = \frac{5}{2}(x + \frac{2}{3}) - \frac{1}{3}x$

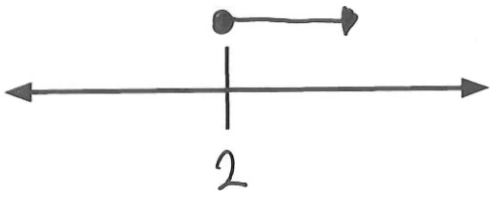
$X = \frac{4}{3}$

Topic 4: Solve and graph multi-step linear inequalities

Solve each inequality for x and graph the solution(s) on the number line. Write your final answer as improper fractions if necessary.

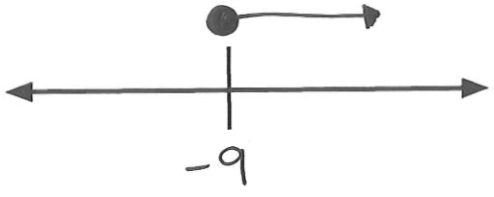
$4x - 7 \geq 1$

$x \geq 2$



$8 - 2n \geq 26$

$n \geq -9$



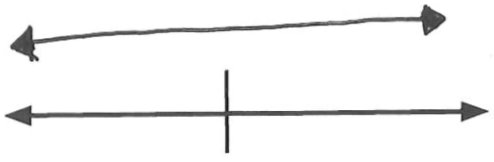
$7p - 11p + 3 > 3 - 4p$

NO solution

$-2(n - 3) \geq 1 - 2n + 5$

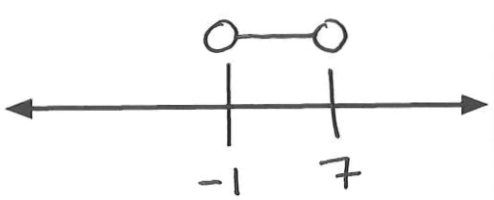
$x \in \mathbb{R}$

All Real Numbers



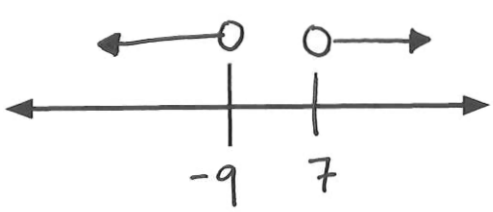
$9 < 3x + 12 < 33$

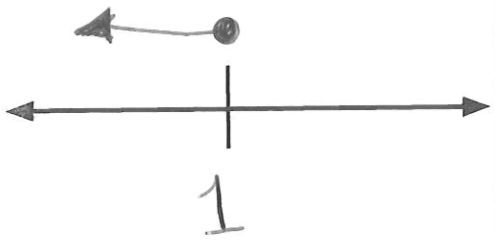
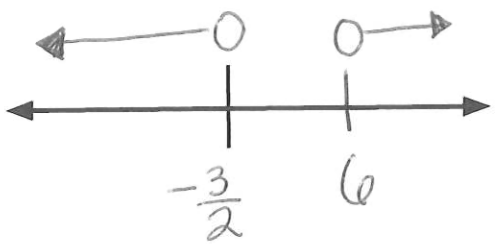
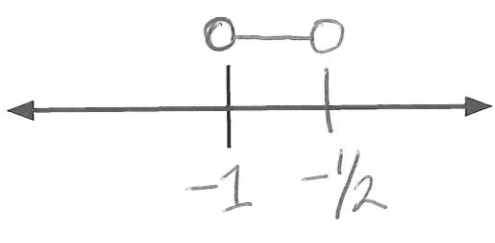
$-1 < x < 7$



$x + 14 < 5 \quad or \quad -6x <- 42$

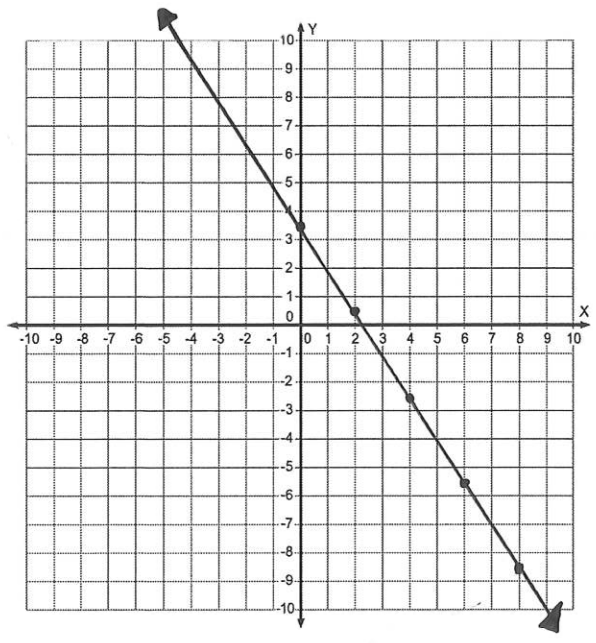
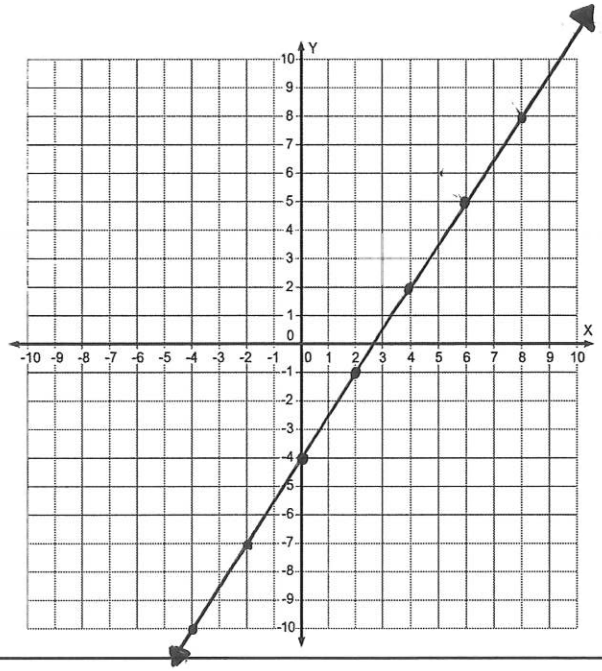
$x < -9$ OR $x > 7$



$7 - 3x \geq -5$ *and* $-2 \leq 5 - 7x$	$\lvert 4x - 9 \rvert + 20 > 35$	$5 - 3\lvert 4x + 3 \rvert > 2$
$x \leq 1$ 	$x < -\frac{3}{2}$ OR $x > 6$ 	$-1 < x < -\frac{1}{2}$ 

Topic 5: Graph linear equations in various forms

Graph the following linear equations.

$3x + 2y = 7$	$\frac{3}{4}x - \frac{1}{2}y = 2$
	

Topic 6: Identify the x- and y- intercepts of equations

Identify the x- and y- intercept of each equation algebraically.

$10x - 4y = -20$ x-intercept: $(-2, 0)$ y-intercept: $(0, 5)$	$y = 2x + 3$ x-intercept: $(-\frac{3}{2}, 0)$ y-intercept: $(0, 3)$
$x = 3$ x-intercept: $(3, 0)$ y-intercept: None, doest not exist	$y = -7$ x-intercept: None, does not exist y-intercept: $(0, -7)$

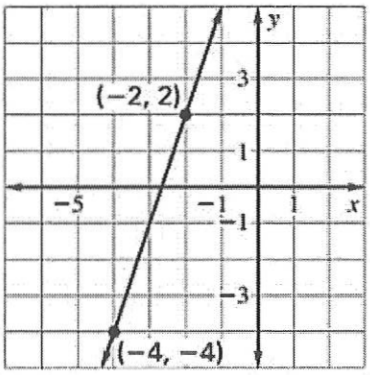
Topic 7: Write equations of lines in slope-intercept or standard form given various data

Use the given information to write the equation of the line in slope-intercept form AND standard form.

***Remember, for Standard Form, the A value must be greater than 0 and a whole number. ***

Information	Slope-intercept form	Standard form
$(-10, 7)$ & $(5, -3)$	$y = -\frac{2}{3}x + \frac{1}{3}$	$2x + 3y = 1$
$(-5, 12)$ & $(-5, -4)$	$x = -5$	$x = -5$

Information	Slope-intercept form	Standard form
$(-11,-3)$ & $(6,-3)$	$y=-3$	$y=-3$
Passes through the point $(3,5)$ and has a slope of 2	$y=2x-1$	$2x-y=1$
x-intercept of 4, and y-intercept of -2	$y=\frac{1}{2}x-2$	$x-2y=4$
Passes through the point (-2,3) and is parallel to the line 2x-4y=10	$y=\frac{1}{2}x+4$	$x-2y=-8$

Information	Slope-intercept form	Standard form
Passes through the point (-3,2) and is perpendicular to the line 2x-4y=10	$y=-2x-4$	$2x+y=-4$
Passes through the point (-7,-5) and is perpendicular to the line y=-4	$x=-7$	$x=-7$
Passes through the point (-3,11) and is parallel to the line y=8	$y=11$	$y=11$
	$y=3x+8$	$3x-y=-8$

Topic 8: Solve systems of linear equations in two variables using elimination and substitution methods.

Solve the linear system by using BOTH substitution and elimination. Write your answers as improper fractions if necessary.

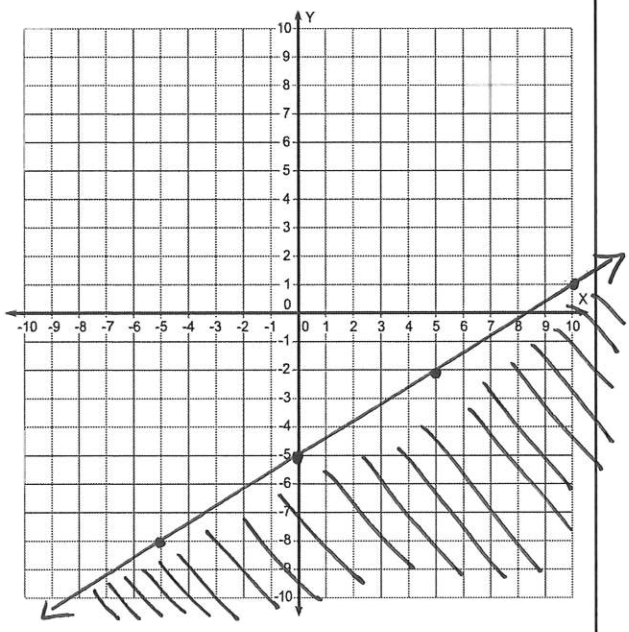
Linear System	Substitution Method	Elimination Method
$3x - 2y = 24$ $2y = -x + 8$	(8,0)	(8,0)
$3x = -2y + 4$ $-6x + 8 = 4y$	All points on the line (same line)	All points on the line (same line)
$4y = x - 3$ $-3x = -2y + 1$	(-1, -1)	(-1, -1)

Linear System	Substitution Method	Elimination Method
$y = -2x + 6$ $6x + 3y = -21$	NO solution (parallel lines)	NO solution (parallel lines)

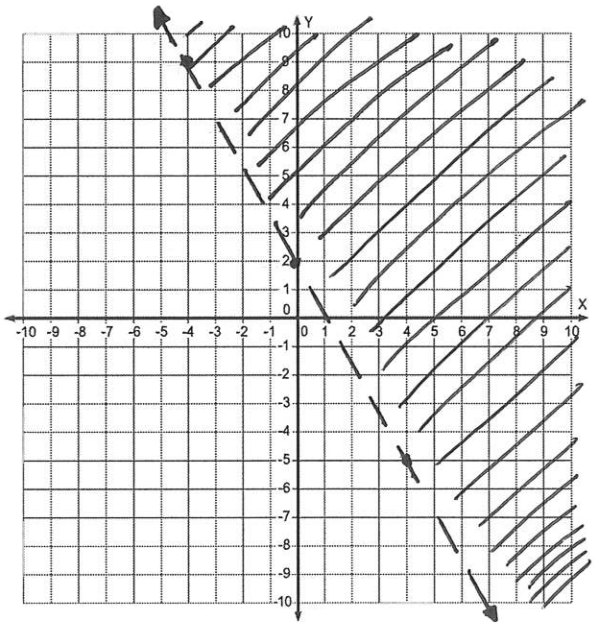
Topic 9: Graphing and solving linear inequalities and systems of linear inequalities.

Graph the following inequalities. Label the solution region.

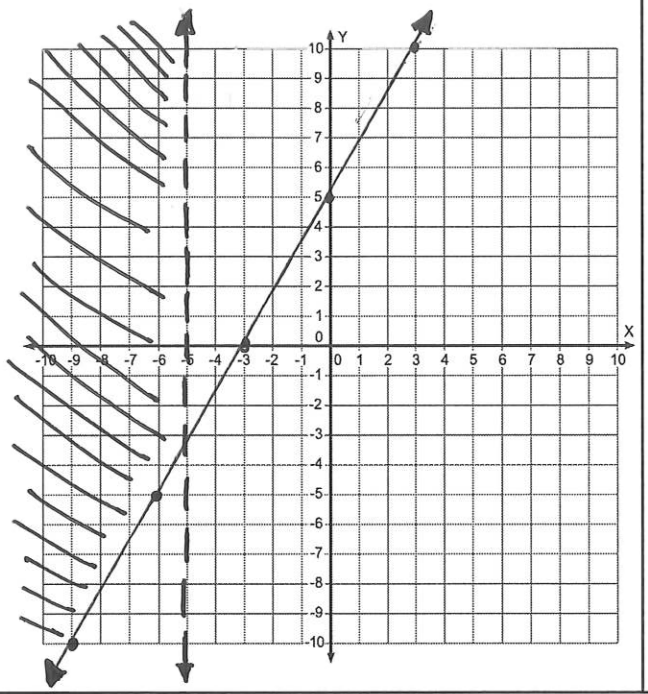
$y \leq \frac{3}{5}x - 5$



$y > -\frac{7}{4}x + 2$

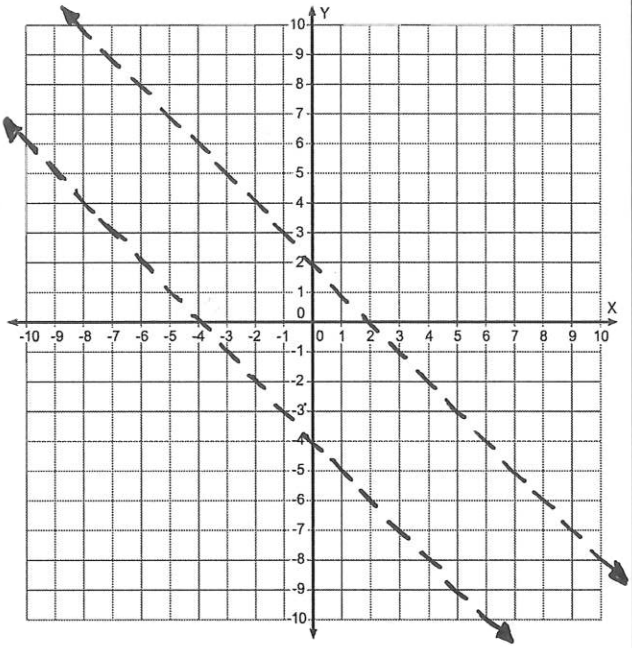


$x <- 5$
$5x - 3y \leq - 15$



$x + y > 2$
$x + y <- 4$

NO solution



Topic 10: Simplifying polynomial expressions (add, subtract, and multiply).

Simplify each expression.

$(4 + 2x^2) + (5x^2 + 2)$	$(12x^2 - 2x + 18) - (14x^2 - 3x + 9)$	$(2x + 8)(3x - 9)$
$7x^2+6$	$-2x^2-5x+27$	$6x^2+6x-72$

$(x + 4)^2$ $x^2+8x+16$	$(3x - 1)^2$ $9x^2-6x+1$	$(5x + 2)(5x - 2)$ $25x^2-4$
$x(5x + 4) + 8$ $5x^2+4x+8$	$(4x - 1)(4x + 1)$ $16x^2-1$	$x^2(3x^2 - 7x + 11) - x(2x^2 - 5x - 12)$ $3x^4-9x^3+16x^2+12x$

Topic 11: Simplifying polynomial expressions (dividing).

Simplify each expression below.

$(n^2 + 5n - 50) \div (n - 5)$ $n+10$	$(n^3 - 12n^2 + 34n + 5) \div (n - 5)$ n^2-7n-1

$(8p^3 + 2p^2 - 10) \div (p - 1)$	$(8k^3 + 65k^2 + 62k - 7) \div (k + 7)$
$8p^2+10p+10$	$8k^2+9k-1$

Topic 12: Operations with Exponents

Simplify the following expressions fully. Answers cannot have negative exponents.

d^2d^4 d^6	$(-a)^2(-a)^3$ $(-a)^5$	$(9y^{-4})^2$ $\frac{81}{y^8}$
$(-3r^4t)^3(2rt^4)$ $-54r^{13}t^7$	$\frac{wx^9}{z^{12}}$ $\frac{wx^9}{z^{12}}$	$\frac{a^{10}b^2}{a^4b^9}$ $\frac{a^6}{b^7}$
$(-\frac{mr^4}{p^2})^{-5}$ $\frac{-p^{10}}{m^5r^{20}}$	$\frac{(xy^3)^2}{xy^{-1}}$ xy^5	$\frac{(w^2z^4)^3}{(-wz^5)^2(w^4z^2)}$ 1

Topic 13: Factor polynomial expressions.

Factor each expression completely.

$200x^2 - 128$ $8(5x+4)(5x-4)$	$-y^2 + 13y - 40$ $(y-8)(-y+5)$ OR $-1(y-8)(y-5)$	$2n^2 + 4n - 48$ $2(n-4)(n+6)$
$-4m^2 + 4m + 8$ $-4(m+1)(m-2)$	$3z^2 - 8z + 4$ $(3z-2)(z-2)$	$4d^2 - 17d + 4$ $4(d^2-2d+1)$
$15p^2 - 27p - 6$ $3(5p+1)(p-2)$	$5x^2 - 20x$ $5x(x-4)$	$-7x^3 + 28x$ $-7x(x+2)(x-2)$

Topic 14: Solve quadratic equations using square roots and factoring.

Solve each equation. Write your final answers as improper fractions or simplified radicals if necessary.

$x^2 + 8 = 80$ $\pm 6\sqrt{2}$	$2y^2 - 2 = 144$ $\pm\sqrt{73}$
$6x^2 = -18x$ $\{x \mid x = -3, 0\}$	$8x^2 - 11x = 5x$ $x = \{2, 0\}$
$-2y^2 - 9y = 4$ $y = \{-4, -\frac{1}{2}\}$	$12v^2 + 2 = 11v$ $V = \{\frac{1}{4}, \frac{2}{3}\}$

$-z^2 - 10z = 16$ $z = \{-8, -2\}$	$8m^2 - 6m = 5$ $m = \{-\frac{1}{2}, \frac{5}{4}\}$
$n - 10 = -2n^2$ $n = \{-\frac{5}{2}, 2\}$	$-3x^2 - x = -10$ $x = \{-2, \frac{5}{3}\}$

Topic 15: Quadratic Formula

Solve the following equations using the quadratic formula. Leave your final answers fully simplified, including the radicals.

$15x^2 - 1 = 2x$ $x = \{-\frac{1}{5}, \frac{1}{3}\}$	$5x^2 + x = 5$ $x = \{\frac{-1 \pm \sqrt{101}}{10}\}$

$x^2 + 6x + 1 = 0$ $x = \{-3 \pm 2\sqrt{2}\}$	$5x^2 - 10x + 3 = 0$ $x = \left\{\frac{5 \pm \sqrt{10}}{5}\right\}$
$3x^2 - 8x = -2$ $x = \left\{\frac{4 \pm \sqrt{10}}{3}\right\}$	$8n^2 + 7n - 15 = -7$ $n = \left\{\frac{-7 \pm \sqrt{305}}{16}\right\}$

Topic 16: Simplify radical expressions (add, subtract, multiply, and divide radicals), including rationalizing the denominator and conjugating.

Simplify each expression.

$\sqrt{45}$ $3\sqrt{5}$	$3\sqrt{48}$ $12\sqrt{3}$	$\sqrt{200}$ $10\sqrt{2}$
$7\sqrt{5} + 5\sqrt{5}$ $12\sqrt{5}$	$3\sqrt{8} + 2\sqrt{8}$ $5\sqrt{8}$	$\sqrt{3} \cdot \sqrt{10}$ $\sqrt{30}$

$3\sqrt{5} \cdot - 2\sqrt{12}$ $-12\sqrt{15}$	$3\sqrt{3} \cdot \sqrt{3}$ 9	$6\sqrt{6} - 9\sqrt{6}$ $-3\sqrt{6}$
$\sqrt{5^2}$ 5	$(\sqrt{19})^2$ 19	$\frac{6}{\sqrt{2}}$ $3\sqrt{2}$
$\frac{10}{\sqrt{10}}$ $\sqrt{10}$	$\frac{12}{\sqrt{3}}$ $4\sqrt{3}$	$\frac{1}{\sqrt{5}}$ $\frac{\sqrt{5}}{5}$
$\frac{\sqrt{5}+2}{2-\sqrt{3}}$ $2\sqrt{3}+2\sqrt{5}+\sqrt{15}+4$	$\frac{2}{\sqrt{6}-3}$ $\frac{2\sqrt{6}-6}{15}$	$\frac{5}{\sqrt{2}-\sqrt{3}}$ $-5\sqrt{2}+5\sqrt{3}$

Topic 17: Characteristics of Quadratic Functions

How to:

$$\underline{a}x^2 + \underline{b}x + \underline{c}$$

Finding the Vertex	1. Plug in the values from your equation into $x = \frac{-b}{2a}$ to find your x-value 2. Once you have your x-value, plug it back into your original equation to find your y-value 3. Write your vertex as (x,y).
Axis of Symmetry	1. Plug in the values from your equation into $x = \frac{-b}{2a}$ to find your x-value 2. Write your equation for the axis of symmetry as $x =$_____
y-intercept	1. Identify the C-value of your equation 2. Write your answer as $(0, C)$
x-intercept	1. Factor your equation 2. Set each answer equal to 0 3. Solve for x 4. Write your answer as $x =$_____ , _____.
Minimum or Maximum	1. If a > 1, the function has a minimum 2. If a < 1, the function has a maximum
Range	1. Identify the vertex 2. Identify whether the graph has a maximum or minimum 3. Write your range For example, if the function has a maximum at (-2,4) then the range is $y \leq 4$, since the function does not go higher than 4

Find the following information. You must be able to do these problems below WITHOUT a calculator.

$$y = x^2 + 2x - 15$$

Axis of Symmetry: $x = -1$

Vertex: $(-1, -16)$

Domain: Write answers in interval notation $(-\infty, \infty)$

Range: Write answers in interval notation $[-16, \infty)$

Zeros: $x = \{-5, 3\}$

$y = -2x^2 + 20x - 18$	**Maximum or Minimum?** maximum = (5, 32)
	Y-Intercept (0, -18)
	Vertex (5, 32)
	Domain: Write answers in interval notation $(-\infty, \infty)$
	Range: Write answers in interval notation $(-\infty, 32]$

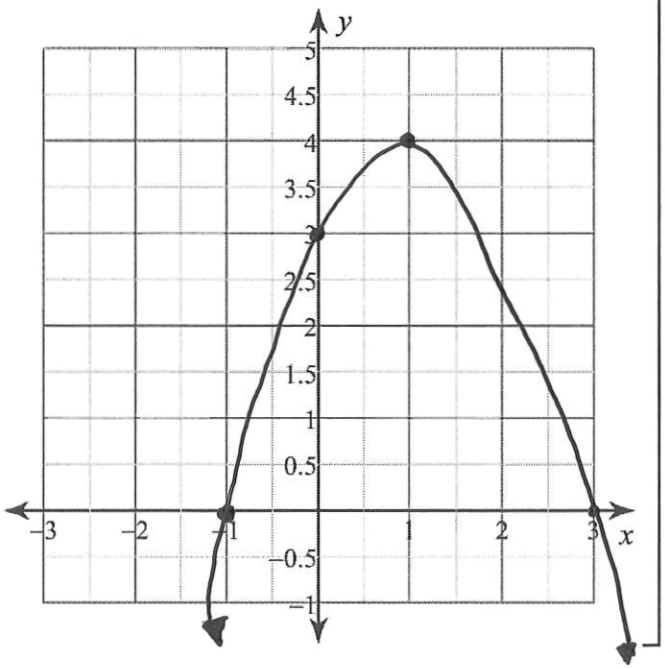
Topic 18: Graphing Quadratic Functions

How to:

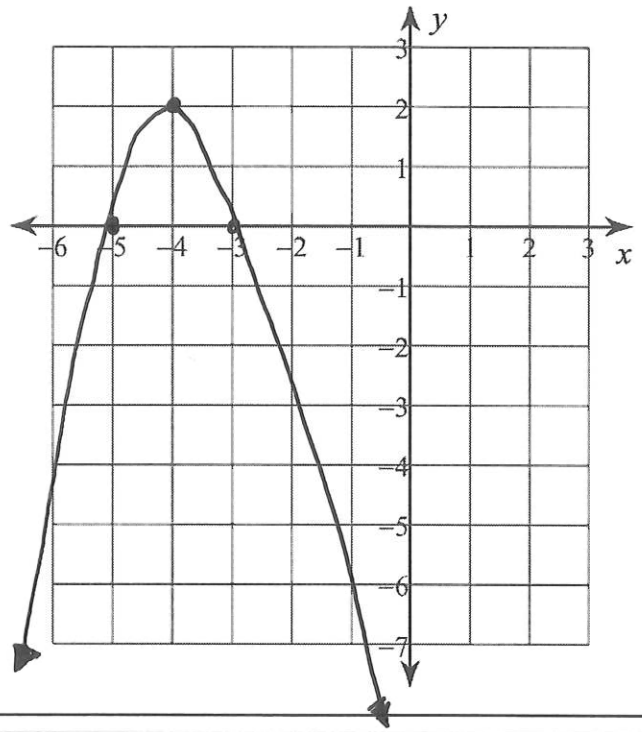
1. Identify the vertex and plot
2. Identify whether the function has a maximum or minimum
3. Identify the zeros and plot
4. Identify the y-intercept and plot (if possible)
5. Identify at least three points on either side of the vertex (plug in values and solve for y)
6. Connect your points with lines

Graph the following quadratic function.

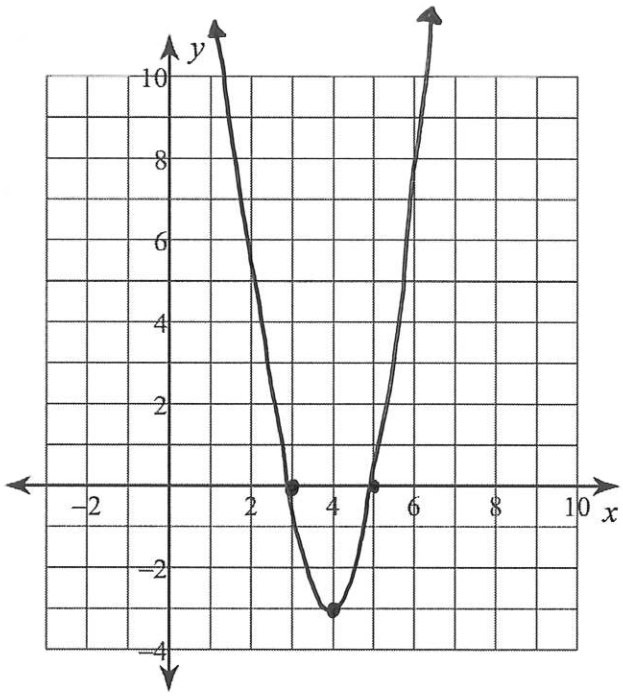
$y = -x^2 + 2x + 3$



$y = -2x^2 - 16x - 30$



$y = 3x^2 - 24x + 45$



Answer key to this summer packet will be posted on the KJMS website by the end of June.