Amity Regional High School

Algebra 2 Essential Skills

Welcome to your Algebra 2 Success Problem-set! This packet is designed to help you review key concepts and strengthen your math skills before the next school year. It covers essential topics such as equations, functions, and quadratics to reinforce what you've learned and preparing you for future lessons.

Complete each section carefully. Show all work and use the provided formulas when necessary. If you get stuck, you can look up the **bolded words** on the internet or ask for help. By working through this packet, you'll build confidence and stay sharp in algebra.

Let's get started—happy learning!

For more practice join Delta Math classroom with code J8W6-N8EK

Part 1 – Solving Equations and Inequalities

I can simplify expressions using the **order of operations** and **substitution**. This helps me solve math problems accurately by following the correct sequence of steps.

a. $2^3 \cdot (9-2) + \frac{12}{4} - |-5|$

b. $w^2 - 5xy$
(if x = -3, w = -2, and y = 1)

c. $\frac{\sqrt{bc}}{(c-a)^2 + b}$
(if a = 1, b = -20, and c = -5)

I can **solve proportions** by finding the missing value in equivalent ratios. This helps me compare quantities and solve real-world problems involving scaling.

a. $\frac{12}{30} = \frac{10}{x}$

b. $\frac{x-4}{3} = \frac{7}{8}$

c. A car travels 150 km on 12 liters of gas. How many liters are needed for 500km?

I can **solve equations** by isolating the variable using inverse operations. This helps me find unknown values and understand mathematical relationships.

a. $5x-7=2x+20$ b. $10-3x=2x-8x+20$ c. $\frac{2}{3}+\frac{1}{4}x=\frac{1}{3}$

I can use the **distributive property** to simplify expressions and multiply binomials. This helps me expand expressions correctly and solve algebraic problems efficiently.

a. $2x(x+1)$ b. $(4x+7)(5x-2)$ c. $(2x-3)^2$

I can **solve inequalities** by using inverse operations and following the rules for inequality signs. This helps me determine ranges of possible solutions in real-world situations.

a. $-2(x+4)<-16$ b. $6(z-5)<5(7-2z)$ c. $\frac{x}{4}-\frac{1}{6}\leq 12$

I can **simplify radicals** by factoring out perfect squares, cubes, or higher powers. This helps me express square roots and other roots in their simplest form for easier calculations

a. $\sqrt{121}$ b. $\sqrt{32}$ c. $\sqrt{162}$

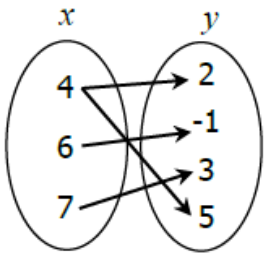
Part 2 – Functions and Relations

I can **identify functions** from graphs, tables, and sets of ordered pairs.

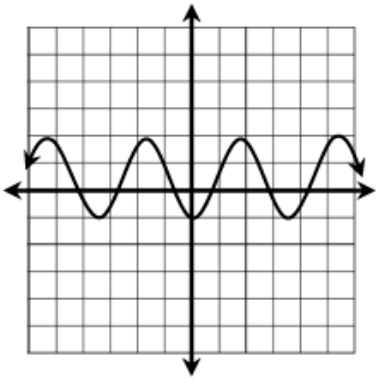
Determine whether the following relations represent a function

a. {(2,3), (4,5), (6,7), (2,8)}

b.



c.

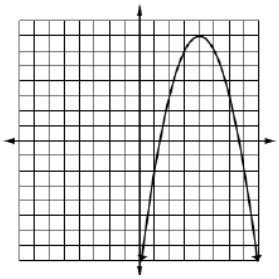


I can **evaluate functions** using function notation.

a. If $f(x) = -x - 7$, find $f(-5)$.

b. If $h(x) = 1 - \frac{2}{3}x$, find $h(-6)$.

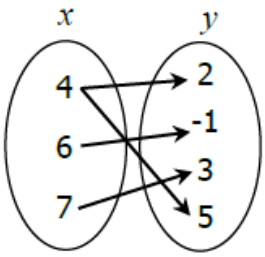
c. Given the graph of $f(x)$ below, find $f(3)$.



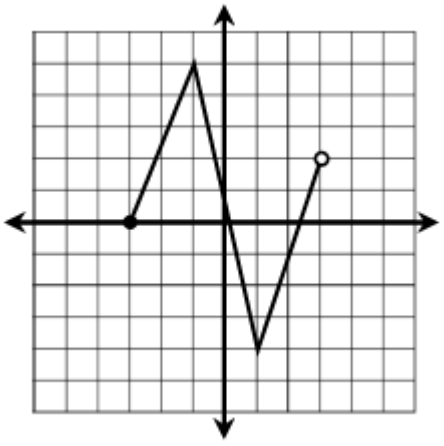
I can **determine the domain and range** of a function using inequalities and interval notation.

a. {(2,3), (4,5), (6,7), (2,8)}

b.



c.



Domain: Range:	Domain: Range:	Domain: Range:

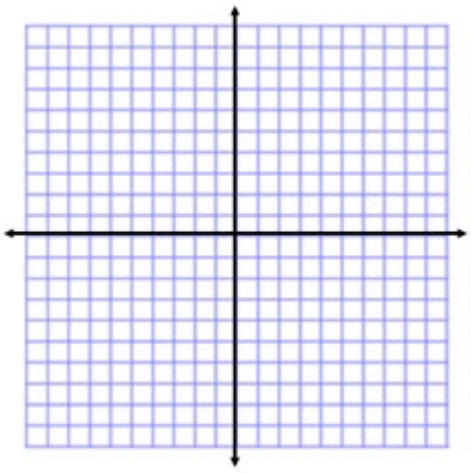
Part 3 – Linear Equations

I can **graph lines** using slope and y-intercept or a table of values. This helps me visually represent linear relationships and understand their patterns.

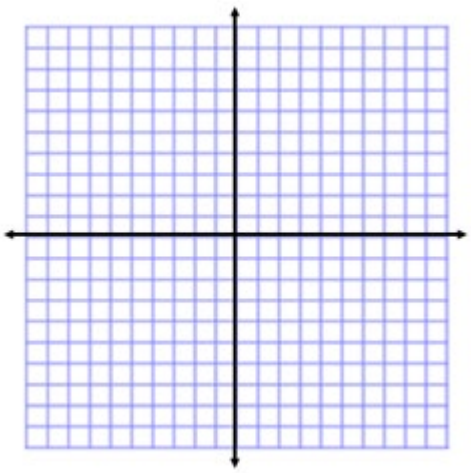
a. What is the slope of a horizontal line?

b. What is the slope of a vertical line?

c. Graph y = 3

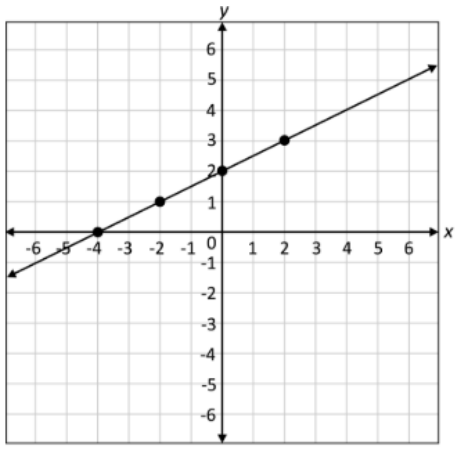


d. Graph x = -4

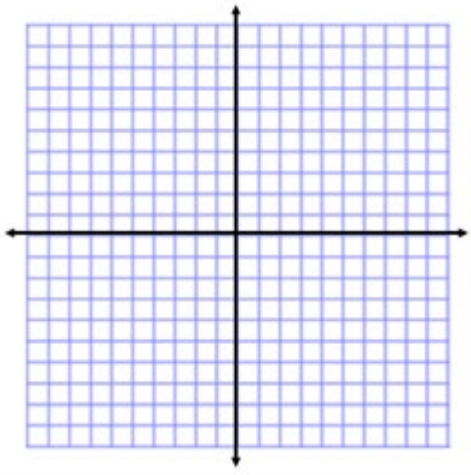


I can **write the equation of a line in slope-intercept** form (y = mx + b). This helps me understand the slope and y-intercept, making it easier to graph and analyze linear relationships.

a. Write the equation of the line shown below in slope-intercept form



b. Graph the linear function $y-2=3(x-1)$



c. Write the equation in slope-intercept form of the line that passes through (1, -12) and (10, 6)

the line goes through (1,-12) and (10,6).

I can identify and write equations for **parallel and perpendicular lines**. This helps me understand how slopes determine the relationship between lines in a coordinate plane.

a. Given the line $y = \frac{2}{11}x - 3$ 1) What is the slope of a line that is parallel to this line?

2) What is the slope of a line that is perpendicular to this line?

b. Write the equation of a line that is parallel to $2x - 4y = 10$ and passes through (-8, 7)

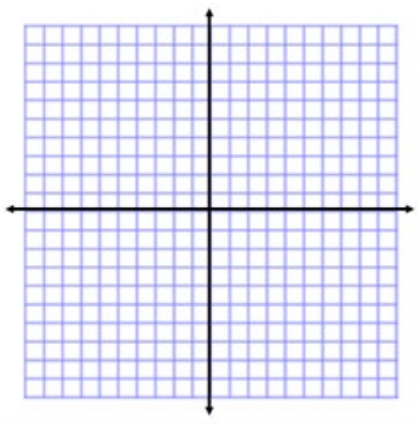
c. Write the equation of a line that is perpendicular to $y = \frac{2}{5}x - 4$ and passes through (4, 0)

I can **solve systems of equations** using substitution, elimination, or graphing. This helps me find the point where two equations intersect and solve real-world problems involving multiple variables.

a. Solve by graphing.

$y = -x + 5$

$y = \frac{1}{2}x + 2$



b. Solve by substitution.

$x = y + 2$

$3x + y = 6$

c. Solve by Elimination

$x + 2y = 0$

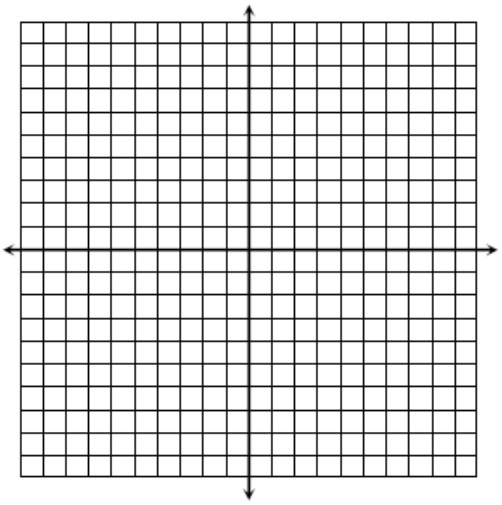
$x + y = -3$

Part 4 – Quadratic Functions and Equations

I can **graph quadratics** in standard, vertex, and factored forms.

$y = x^2 - 6x + 8$

x	y



Domain:

Range:

Axis of Symmetry:

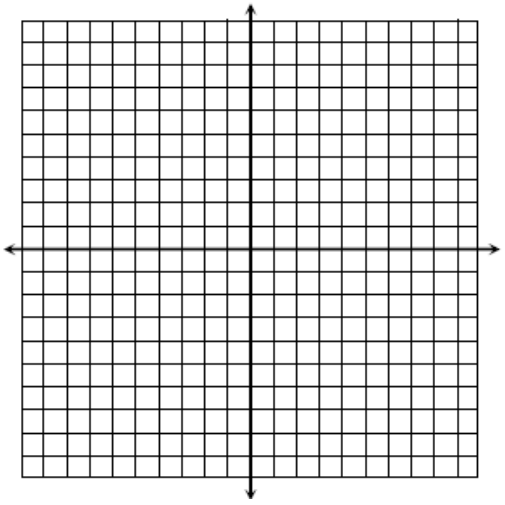
Vertex:

x-intercepts (zeros):

y-intercept:

$y = -(x + 4)^2 + 9$

x	y



Domain:

Range:

Axis of Symmetry:

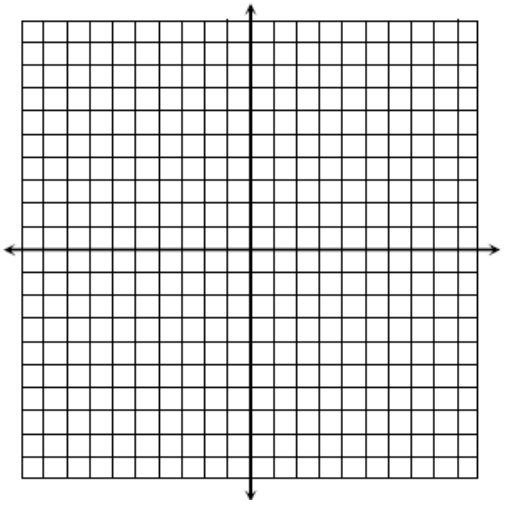
Vertex:

x-intercepts (zeros):

y-intercept:

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

x	y



Domain:

Range:

Axis of Symmetry:

Vertex:

x-intercepts (zeros):

y-intercept:

I can **solve equations using the square root method** and express answers in simplest radical form. This helps me find exact solutions for quadratic equations without factoring or using the quadratic formula.

a. $x^2 = 72$ b. $x^2 + 16 = 97$ c. $(x-2)^2 = 64$

I can **factor expressions** by finding common factors or applying special factoring formulas. This helps me simplify expressions and solve quadratic equations more easily.

a. $6x^2 + 9x$ b. $x^2 - 14x + 49$ c. $x^2 + 8x + 15$

I can **solve quadratic equations by factoring** when the leading coefficient (a) is 1. This helps me find the solutions by setting each factor equal to zero and solving for the variable.

a. $x^2 - 6x - 16 = 0$ b. $x^2 - x = 42$ c. $x^2 = -7x + 60$

Part 5 – Exponents and Polynomials

I can simplify expressions using **exponent rules.**

$7m \cdot m^2 \cdot 8v^5$ $(4x^3y^5)^3$ $\frac{35k^{10}}{5k^2}$

$(-2a^6bc^3)^2 \cdot -5ab^2$ $\frac{a^{12}b^{-3}}{(ab)^{-4}}$ $\left(\frac{c^{-7}d}{3c^{-2}d^5}\right)^4$

I can **add, subtract, and multiply polynomials**.

$(2x^2+3x-2)-(x^2-4x-1)$ $3a^2b^3(2a^2-7ab+b^2)$ $(2y-1)^2$

$\frac{18a^3b+12a^2b^2-6ab}{6ab}$ $(x-4)(x^2+5x+3)$ $8p(p^2+7p-2)-(9p^3-2p^2)$

Algebra 2 Honors

Students entering Algebra 2 Honors have demonstrated mastery of all prerequisite Common Core math standards and consistently exhibit strong problem-solving and critical thinking skills. They are confident, independent, and collaborative learners who approach challenging topics with enthusiasm and perseverance.

This course emphasizes deep understanding through exploration, discussion, and application. Students should be ready to engage in abstract reasoning, construct and critique arguments, model with mathematics, and use precise mathematical language and tools effectively. The instructional approach promotes curiosity, resilience, and leadership in a rigorous learning environment.

Part 6 – Open Ended Questions - I can persevere when solving more challenging math problems.

a. Create a system of linear equations that has one solution in quadrant 3. Additionally, both lines should have a negative slope.

b. Create a system of linear equations where the solution is (4,-11). Additionally, the lines are perpendicular and the lines are not horizontal nor vertical.

c. Create a system of equations with one quadratic equation and one linear equation that has no solutions. Explain how you know there is no solution.

d. Create a system of quadratic equations (both are quadratic equations) that has one solution. How do you know it has one solution?

e. Sketch a graph of a **FUNCTION** that has a domain of $(-\infty, 4]$ and a range of $(0,\infty)$

f. Create a quadratic equation that is opening down, has 2 x-intercepts (one positive and one negative) and has an axis of symmetry of x= - 3

g. Create a quadratic equation with a vertex in quadrant 2 that has x-intercepts that are irrational.

h. Create a quadratic equation with one x-intercept (positive) and passes through the point (-4,-8).