End of Course Review

NUMBER SENSE, QUADRATIC FUNCTIONS AND OPERATION SKILLS

Warm Up – What do you remember?

1. What are the zeroes of the quadratic function $f(x) = x^2 + 3x + 1$?
2. Sketch the solution set to $x^2 - 6x + 7 \leq 2x - 5$.
3. For the equation $x^2 - 4x + 4 = 9$, determine the number and types of roots.
4. Given the equation: $(x - 2)^2 + (y - 4)^2 = 25$ name the center and radius of the circle.
5. Given the equation:$(x - 2)^2 + (y - 4)^2 = 25$ sketch a graph of the circle.

Graph and Solve Quadratic Equations and Inequalities

- Solving Quadratics Equations and Inequalities:
  - When solving quadratic equations and inequalities, always make sure the equation is set equal to 0.
  - Factor the equation if possible. Factoring is looking for what multiplies to get the original problem.
  - Example: $x^2 + 9x + 18 = 0$

    $(x + 6)(x + 3) = 0$

    $x + 6 = 0 \quad x + 3 = 0$

    $x = -6; x = -3$ (Called roots, zeros, solutions, x-intercepts)

Remember: Multiply a and c; look for factors that add to b.

a · c 1 · 18	b 9
1 · 18	19
2 · 9	11
3 · 6	9

- If quadratic equation cannot be factored, use quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Equation must be in standard form and set equal to 0.
($ax^2 + bx + c = 0$)

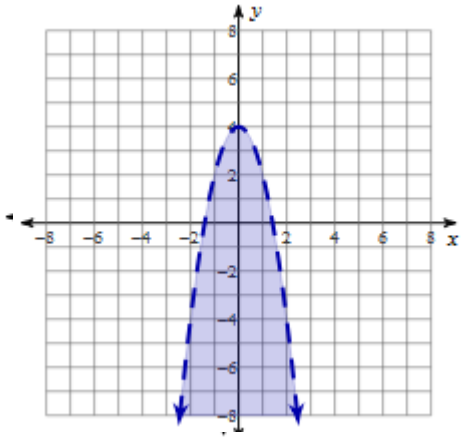
1. What are the zeroes of the quadratic function $f(x) = x^2 + 3x + 1$?

Graph and Solve Quadratic Equations and Inequalities

- Remember when solving quadratics:
- If there is a negative number under the radical you have complex roots
- Complex (Imaginary) Roots come in Pairs!!!
  - Will have the same real number, opposite sign on the complex (imaginary) piece

Graph and Solve Quadratic Equations and Inequalities

- Quadratics Inequalities:
  - Can also be solved by graphing the inequality on a coordinate plane.
  - Example: Graph $y < -2x^2 + 4$.
    - Change the inequality to an equality: $y = -2x^2 + 4$.
    - Graph the equation (find vertex $x = -b/2a$, then find y by substituting x into equation)
    - $y < -2x^2 + 4$
    - $<$ or $\leq$ shade below
    - $>$ or $\geq$ shade above



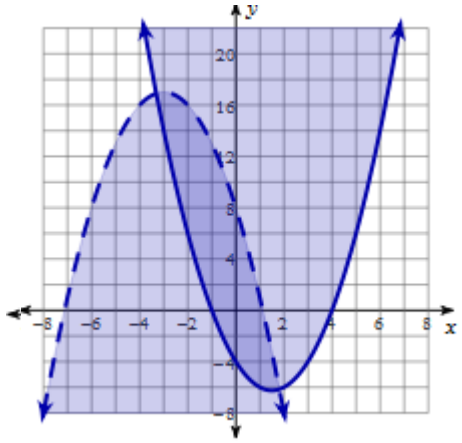
- **2. Sketch is the solution set to $x^2 - 6x + 7 \leq 2x - 5$?**

Graph and solve systems of quadratic inequalities

- When solving a system of quadratic inequalities, graph both quadratic functions and look for the areas of intersection
- Example: What is the solution to the system of inequalities:

$$y \geq x^2 - 3x - 4$$

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



Determine number and type of roots for a quadratic equation

- To do this, use the discriminant of the quadratic formula:

$$\text{Discriminant } D = b^2 - 4ac$$

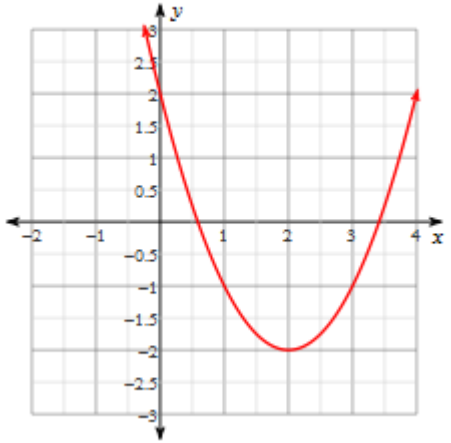
Discriminant	Roots
$D < 0$	No real roots (only complex roots)
$D = 0$	One real roots
$D > 0$	Two real roots

3. For the equation $x^2 - 4x + 4 = 9$, determine the number and types of roots.

Determine the Domain and Range of a Quadratic Function

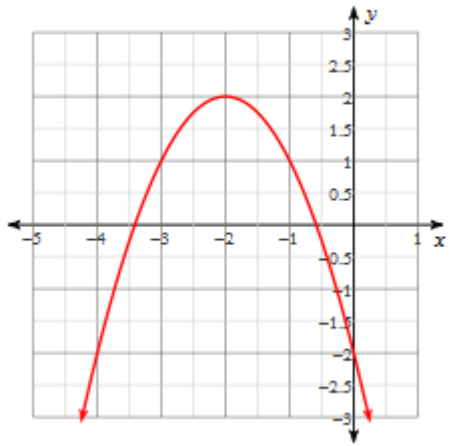
- The domain of a quadratic function is all the x values that lie on the function in the graph from the lowest x value to the highest x value.
- The range is all of the y values that lie on the function in the graph from the lowest y value to the highest y value.
- Examples:

1) $y = x^2 - 4x + 2$



Domain: all x values
Range: y ≥ -2

2) $y = -x^2 - 4x - 2$



Domain: all x values
Range: y ≤ 2

Identify, graph, determine the characteristics of, and write equations of circles and parabolas

- Writing equations of Parabolas:
- To write an equation of a parabola given the vertex and a point on the vertex you will:
- Use vertex form of a quadratic equation: $y = a(x - h)^2 + k$, and substitute the vertex into the equation for (h, k).
- Using the point given, substitute the x and y values into the equation for x and y and solve for a.
- Rewrite the vertex form of the equation using the newly calculated a value. Simplify to get standard form if necessary.

Example:

Write the equation of the parabola with its vertex at (15, 8) and point on the graph (7,-8)

$$y = a(x - 15)^2 + 8$$
$$-8 = a(7 - 15)^2 + 8$$
$$-8 = 64a + 8$$
$$-16 = 64a$$
$$-\frac{1}{4} = a$$

$$y = -\frac{1}{4}(x - 15)^2 + 8$$

Identify, graph, determine the characteristics of, and write equations of circles and parabolas

- The standard form of an equation of a circle is:

$$(x - h)^2 + (y - k)^2 = r^2$$

- Where (h, k) is the center of the circle (both are liars!!!)
- r is the radius
- Example:

  Find the equation of the circle with the center at (-1, 4) and a radius of 15.

$$\boldsymbol{(x + 1)^2 + (y - 4)^2 = 225}$$

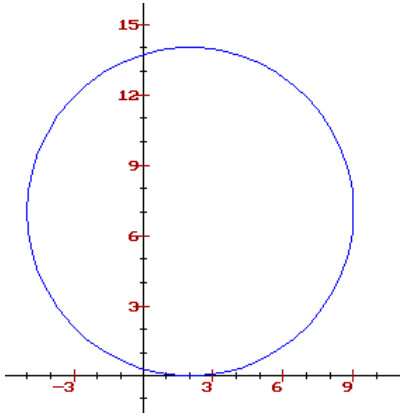
4. Given the equation: $(x - 2)^2 + (y - 4) = 25$ name the center and radius of the circle.

Identify, graph, determine the characteristics of, and write equations of circles and parabolas

- Graphing Circles:
- From the equation, find the center (h, k) and then the radius (r).
- Plot the center point on a coordinate plane
- Using the radius, find 4 points on the circle, then sketch the graph.
- Example:

  The equation of a circle is $(x - 2)^2 + (y - 7)^2 = 49$.

  Graph the circle.



5. Given the equation:$(x - 2)^2 + (y - 4) = 25$ sketch a graph of the circle.