

Test Topics Graphs and Quadratics:

- Determine the vertex of a quadratic
 - From vertex form $y = a(x - h)^2 + k$ $((h, k))$
 - From standard form $y = ax^2 + bx + c$ $h = \frac{-b}{2a}$ and $k = f(\frac{-b}{2a})$
- Determine AOS, Domain/Range/Max/Min (ALL related to vertex)
- Convert from standard to vertex form – Completing the Square
- Convert from vertex to standard – FOIL
- Describe transformation from parent graphs (___ units UP/DOWN, ___ units RIGHT/LEFT, Flipped on the x – axis, narrower/wider, etc.)
- Quick Sketch of Quadratic Equation (Label Vertex, 5 points, AOS)
- Solving Quadratics (includes imaginary solutions):
 - Factor
 - Completing the Square/Square Root Property
 - Quadratic Formula
 - TI-84 (Method 1 and Method 2) – Likely word problem

REVIEW

1. Determine the Vertex: $f(x) = -3x^2 - 4x + 5$

$$h = -\frac{b}{2a} = \frac{-(-4)}{2(-3)} = \frac{4}{-6} = -\frac{2}{3}$$

$$k = -3\left(-\frac{2}{3}\right)^2 - 4\left(-\frac{2}{3}\right) + 5 = -3\left(\frac{4}{9}\right) + \frac{8}{3} + 5 = -\frac{4}{3} + \frac{8}{3} + \frac{15}{3} = \frac{4}{3} + \frac{5}{1} = \frac{4+15}{3} = \frac{19}{3}$$

$$\text{Vertex: } \left(-\frac{2}{3}, \frac{19}{3}\right)$$

2. Determine the Vertex: $f(x) = 4(x+7)^2 - 2$

$$\text{Vertex: } (-7, -2)$$

3. Given, $y = 2(x-3)^2 + 1$. Determine: Vertex, Min/Max, Domain/Range, AOS, Graph.

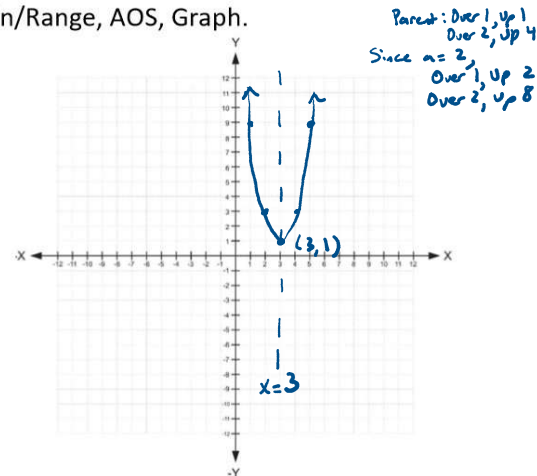
$$\text{Vertex: } (3, 1)$$

Minimum at $(3, 1)$; minimum value: $y = 1$
minimum since opening upwards

$$D: \{ \mathbb{R} \}$$

$$R: \{ \mathbb{R} \mid y \geq 1 \}$$

$$\text{AOS: } x = 3$$



4. Convert to vertex form: $y = x^2 + 12x - 13$

$$y = x^2 + 12x + 6^2 - 6^2 - 13$$

$$y = (x+6)^2 - 36 - 13$$

$$y = (x+6)^2 - 49$$

5. Convert to standard form: $y = -2(x+1)^2 - 3$

$$y = -2(x+1)(x+1) - 3$$

$$y = -2(x^2 + 1x + 1x + 1) - 3$$

$$y = -2(x^2 + 2x + 1) - 3$$

$$\left\{ \begin{array}{l} y = -2x^2 - 4x - 2 - 3 \\ y = -2x^2 - 4x - 5 \end{array} \right.$$

6. Describe the transformation: $y = -2|x+7| - 8$

Flipped on x-axis, narrower, 7 units Left, 8 units Down

7. Solve by Factoring: $3x^2 - 16x = -5$

$$3x^2 - 16x + 5 = 0$$

$$(3x-1)(x-5) = 0$$

$$\left\{ \begin{array}{l} 3x-1=0 \\ +1 \quad +1 \\ \frac{3x}{3} = \frac{1}{3} \end{array} \right.$$

$$x = \frac{1}{3}$$

$$\left\{ \begin{array}{l} x-5=0 \\ +5 \quad +5 \\ x=5 \end{array} \right.$$

8. Solve by Quadratic Formula: $2x^2 + 3x = -18$

$$2x^2 + 3x + 18 = 0$$

$$a = 2 \quad b = 3 \quad c = 18$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(18)}}{2(2)}$$

$$x = \frac{-3 \pm \sqrt{9 - 144}}{4}$$

$$x = \frac{-3 \pm \sqrt{-135}}{4}$$

$$x = \frac{-3 \pm i\sqrt{9 \cdot 15}}{4}$$

$$x = \frac{-3 \pm 3i\sqrt{15}}{4}$$

9. Solve by Completing the Square: $x^2 - 6x - 7 = 0$

$$\left\{ \begin{array}{l} x^2 - 6x + 3^2 - 3^2 - 7 = 0 \\ (x-3)^2 - 9 - 7 = 0 \\ \sqrt{(x-3)^2} = \pm \sqrt{16} \end{array} \right.$$

$$\left\{ \begin{array}{l} x-3 = \pm 4 \\ +3 \quad +3 \end{array} \right.$$

$$x = 3 \pm 4$$

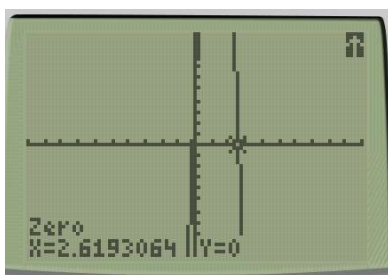
$$\left\{ \begin{array}{l} 3+4 \\ 3-4 \end{array} \right.$$

$$x = 7, -1$$

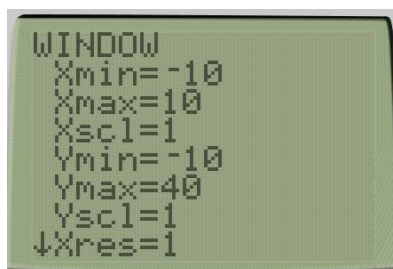
10. Solve by Square Root Property: $4x^2 + 1 = 0$

$$\frac{4x^2}{4} = \frac{-1}{4} \quad \left\{ \quad \sqrt{x^2} = \sqrt{-\frac{1}{4}} \quad \right. \quad \boxed{x = \pm \frac{i}{2}}$$
$$x = \pm \frac{i\sqrt{1}}{\sqrt{4}}$$

11. Mick throws a ball with an initial velocity of 40 feet per second. The equation for the height of the ball is $h = -16t^2 + 40t + 5$, where h represents the height in feet and t represents the time in seconds. When will the ball hit the ground?



2.619 seconds



It's maximum height would
be 30 feet

