Quadratics Cheat Sheet

Standard Form: $y= Ax^2 + Bx + C$

Vertex Form: $y= A(x – h)^2 + k$

- Vertex Form gives you the vertex of the parabola. **Hints the word vertex for.**

  Vertex is: (h, k) ***you take the opposite of h)

  Example 1:

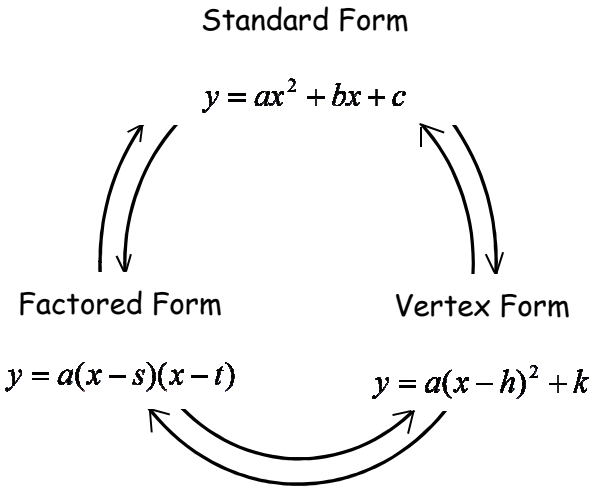
  $Y= (x + 3)^2 - 2$ vertex is: (-3, -2)

- Axis of Symmetry: vertical line that splits the parabola in half. **IT IS ALWAYS THE X-VALUE OF VERTEX**
  - Always write it as x =
  - The axis of symmetry for the example above is x = -3
- H tells us which way the graph moves horizontally (left and right).
  - In the example above the graph has a: horizontal shift to the left 3.
- K tells us which way the graph moves vertically (up and down)
  - In the example above the graph is transformed: vertical shift down 2.
- If there is a negative out front. (A is negative) It causes the graph to open down. We call that being reflected across/about the x-axis.
  - Example: $y= -(x + 3)^2 - 2$
  - The graph is reflected across x-axis. It opens down.
- If A is greater than 1 the graph is stretched vertically
- If A is less than 1 the graph is shrunk vertically
- Y- Intercept- where the graph crosses the y-axis. Always written as a point. For example (0,0). The x-value will always be zero. The Y-Intercept is also the C in the standard form $Ax^2 + Bx + C$.
- Domain: All of the x-values of the graph. If the graph does not have end-points then the domain will be all real numbers. You can write it 3 ways.
  1. Set Notation: $(-\infty, \infty)$
  2. Interval Notation: $-\infty < x < \infty$

3. All Reals

- Range: All of the y-values of the graph. If the graph opens up the range will go from y-value of vertex to positive ∞. For Example: Vertex is: (2,3). Range is:
  - Set Notation: $[3, \infty)$.
  - Interval Notation: $3 \leq y < \infty$
- X- Intercept (s). This is where the graph crosses the x-axis. There may be none, one or 2 depending upon the graph. **Always write as ordered pairs**
- Maximum and Minimum Values- The is the highest or lowest point of the graph located at the vertex. If the graph opens up you will have a minimum value. If the graph open down you will have a maximum value.
- Rate of Change- To determine the rate of change, find the slope of the line that passes through two given points on the function.
- Intervals of Increase and Intervals of Decrease- You will fill in below

Everything I Need to Know about Quadratics…But Was Afraid to Ask!



If you want…	And you have…	Then do this
Vertex Form $y = a(x-h)^2 + k$	Standard Form $y = ax^2 + bx + c$	➢ complete the square or ➢ solve for zeros or partial factor and use to calculate vertex, "a" will be the same
	Factored Form $y = a(x-s)(x-t)$	➢ expand to standard form then convert to vertex form or ➢ solve for zeros and use to calculate vertex, "a" will be the same
Standard Form $y = ax^2 + bx + c$	Vertex Form $y = a(x-h)^2 + k$	➢ expand
	Factored Form $y = a(x-s)(x-t)$	➢ expand
Factored Form $y = a(x-s)(x-t)$	Vertex Form $y = a(x-h)^2 + k$	➢ convert to standard form, then convert to factored form or ➢ solve for zeros and substitute into factored form, "a" will be the same
	Standard Form $y = ax^2 + bx + c$	➢ factor, if possible or ➢ use quadratic formula to find zeros and substitute into factored form

		or ➢ may not have factored form if there are no real roots
to graph	Vertex Form $y = a(x-h)^2 + k$	➢ read vertex/transformations directly from equation ✓ h is horizontal ✓ k is vertical ✓ a is reflection and stretch/compression for improved accuracy, consider finding y-intercept or applying step pattern.
	Standard Form $y = ax^2 + bx + c$	➢ solve for x-intercepts and y-intercept or ➢ solve for vertex and y-intercept
	Factored Form $y = a(x-s)(x-t)$	➢ read zeros from equation, solve for y-intercept or vertex

If you want… And you have… Then do this

y-intercept	Vertex Form $y = a(x-h)^2 + k$	➢ set $x = 0$ and solve for y
	Standard Form $y = ax^2 + bx + c$	➢ set $x = 0$ and solve for y or just look for c
	Factored Form $y = a(x-s)(x-t)$	➢ set $x = 0$ and solve for y
vertex, max/min, optimal value	Vertex Form $y = a(x-h)^2 + k$	➢ read the vertex right from the equation: (h,k)
	Standard Form $y = ax^2 + bx + c$	➢ convert to vertex form or ➢ determine the zeros and use $\frac{s+t}{2}$ to get x-coordinate of vertex (axis of symmetry) , substitute this x to get the y-coordinate or

		➢ use $x = -\frac{b}{2a}$ to get x-coordinate of vertex, substitute this x to get the y-coordinate or ➢ partial factor to get x-coordinate of vertex (axis of symmetry), substitute this x to get the y-coordinate
	Factored Form $y = a(x-s)(x-t)$	➢ use the zeros and $\frac{s+t}{2}$ to get x-coordinate of vertex (axis of symmetry) ➢ substitute this x to get the y-coordinate or ➢ convert to standard form then complete the square
x-intercepts, zeros, roots	Vertex Form $y = a(x-h)^2 + k$	➢ convert to standard form then factor or use quadratic formula or ➢ set $y = 0$ then solve for x using inverse operations
	Standard Form $y = ax^2 + bx + c$	➢ factor if possible or ➢ use quadratic formula or ➢ may not have real roots
	Factored Form $y = a(x-s)(x-t)$	➢ read the zeros right from the equation: s & t
the number of zeros	Vertex Form $y = a(x-h)^2 + k$	➢ analyze location of vertex and opening direction, draw conclusions
	Standard Form $y = ax^2 + bx + c$	➢ use discriminant: D < 0, D = 0, D > 0
	Factored Form $y = a(x-s)(x-t)$	➢ zeros are given in this form