

# Sketching the Graphs of Linear, Absolute Value, Quadratic and Square Root Functions

Although the details of how we sketch each type of graph differ, the basic approach to graphing Linear, Absolute Value, Quadratic and Square Root functions remains the same. In each case, being familiar with the general shape of each type of graph is very important.

1. Identify the vertex (not necessary for Linear functions).

- Absolute Value functions: This is the point at which the definition of the function changes. Solve for the interval on which the expression inside the absolute value is greater than or equal to zero.
- Quadratic functions: This can be determined from the **standard form**,

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

and is the point  $(h, k)$ . A Quadratic function can be written in standard form by **completing the square**.

- Square Root functions: This can be determined from one of the two **standard forms**,

$$y = b\sqrt{x - h} + k \quad \text{or} \quad y = b\sqrt{h - x} + k.$$

Each Square Root function can only be written in one of the two standard forms. In either case, the vertex is the point  $(h, k)$ .

2. Find the  $x$ -intercept(s), if any. For each type of function, this means solving the equation  $f(x) = 0$ .

- Linear functions: There will always be exactly one  $x$ -intercept.
- Absolute Value and Quadratic functions: There may be zero, one or two  $x$ -intercepts.
- Square Root functions: There may be zero or one  $x$ -intercepts.

3. Find the  $y$ -intercept, if it exists. For each type of function, this means evaluating  $f(0)$ .

- Linear, Absolute Value and Quadratic functions: There will always be one  $y$ -intercept.
- Square Root functions: There may be zero or one  $y$ -intercept.

4. Determine as many other points as needed (if any) to accurately sketch the graph.

- Linear functions: We need two points in total.
- Absolute Value functions: We need one point on each side of the vertex.
- Quadratic functions: We need two points on each side of the vertex.
- Square Root functions: We need two points other than the vertex.

5. Plot and label all of the points, and sketch the graph.