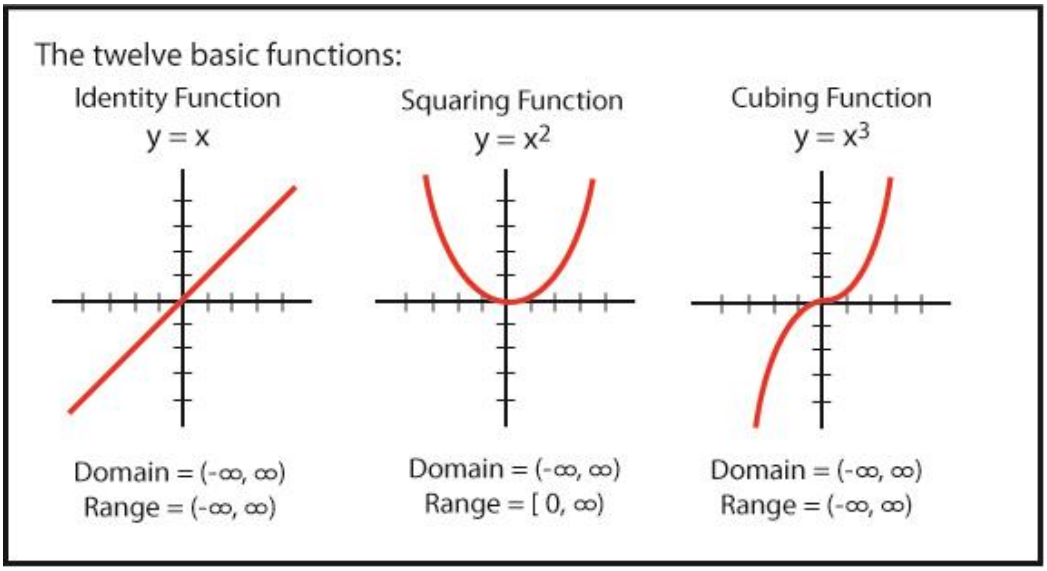
Functions – Families of Functions

There are several basic functions that we use all the time. You need to be familiar with their graphs and their behaviors.



These are also called Power functions, since they are simply x raised to some power.

There are also power functions like: $f(x) = x^4$, $f(x) = x^5$, etc.

ODD and EVEN Functions:

A function is considered **EVEN** if:

$f(-x) = f(x)$ » When you replace every x in the function with –x, the function does not change.

A function is **ODD** if: $f(-x) = -f(x)$ » Replacing x with –x, changes the sign of the function.

EX: $f(x) = x^2$ Is this function even or odd or neither?

Replace x with –x : $f(-x) = (-x)^2 = x^2 = f(x)$, so $f(x) = x^2$ is an EVEN function.

EX: $f(x) = x^3$ Is this function even or odd or neither?

Replace x with –x : $f(-x) = (-x)^3 = -x^3 = -f(x)$, so $f(x) = x^2$ is an ODD function.

Note: Power functions with an <u>even</u> exponent are <u>even</u>. Power functions with <u>odd</u> exponents are <u>odd</u>.

The Graphs of Even and Odd functions:

Even functions: Since the value of the function at x AND –x are the same, even functions are symmetric about the y-axis.

Odd functions: Since the value of the function at –x has the opposite sign of the value of the function at x,

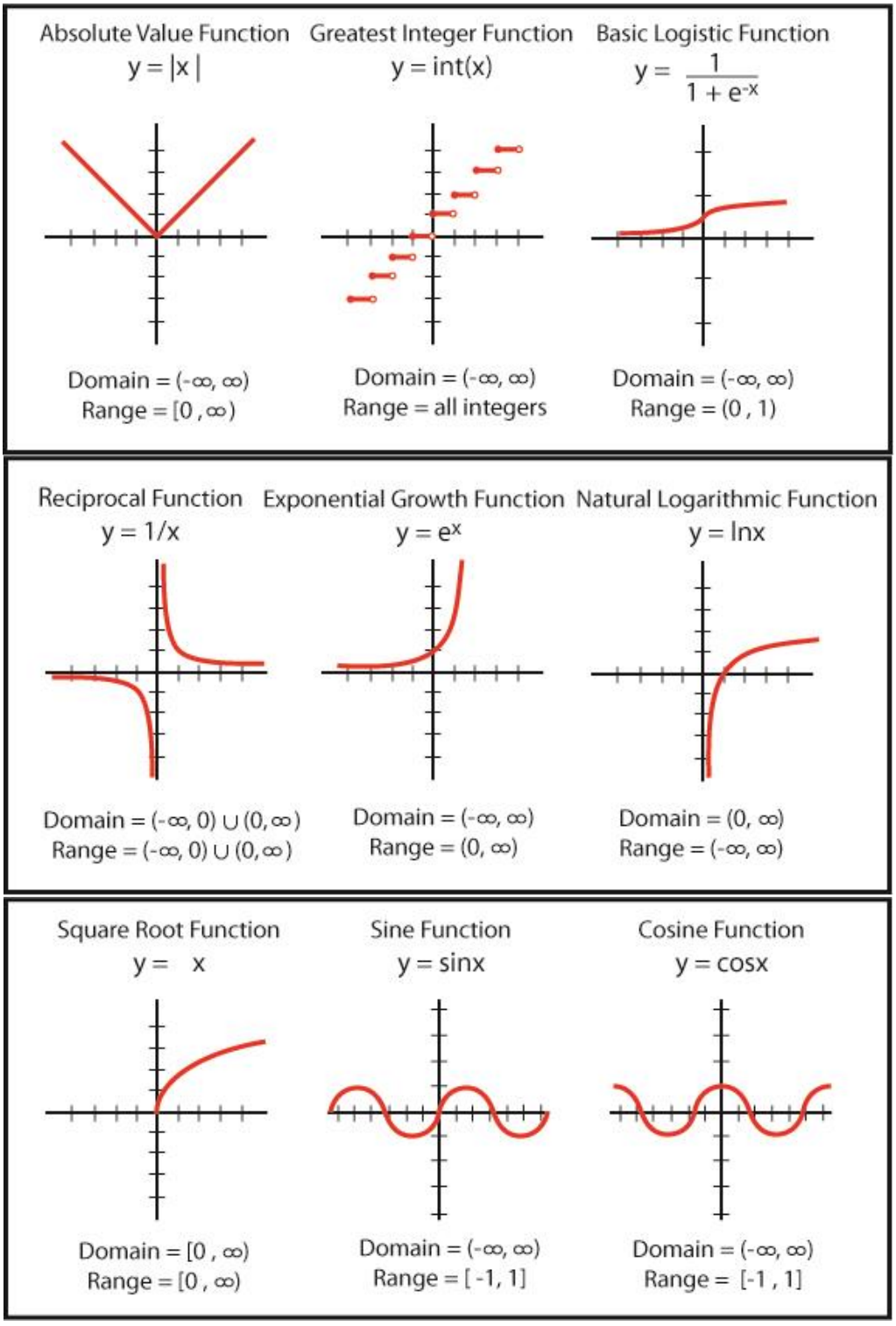
Odd functions are symmetric THROUGH the origin.

End Behavior is how the graph behaves as x goes to infinity and negative infinity.

Power functions that have *even* powers go in the *same* direction as x goes to both ∞ and $-\infty$.

Power functions that have *odd* powers go in *opposite* directions as x goes to both ∞ and $-\infty$.

Other basic functions are:



Note: Functions that don't have either type of symmetry are NEITHER even nor odd.

Some of these functions you may have dealt with before, some will be looked at later in the year.