Finding Domains of Functions

To find the domain and range of a rational function, set the denominator equal to zero and solve. Doing this finds the all values of the variable that will give you zero in the denominator. You cannot have zero in a denominator (undefined) and the values would be restricted in the domain.

Example:

$$f(x) = \frac{1}{x-7}$$

$$x - 7 = 0$$

$$x = 7$$

Set the denominator equal to 0 and solve.

Since 7 gives us a 0 in the denominator, the domain is all real numbers except 7.

Example:

$$\frac{x^2 + x - 2}{x^2 - x - 2}$$

$$x^2 - x - 2 = 0$$

$$(x-2)(x+1) = 0$$

$$x - 2 = 0 \quad \Big| \quad x + 1 = 0$$

$$x = 2 \quad \Big| \quad x = -1$$

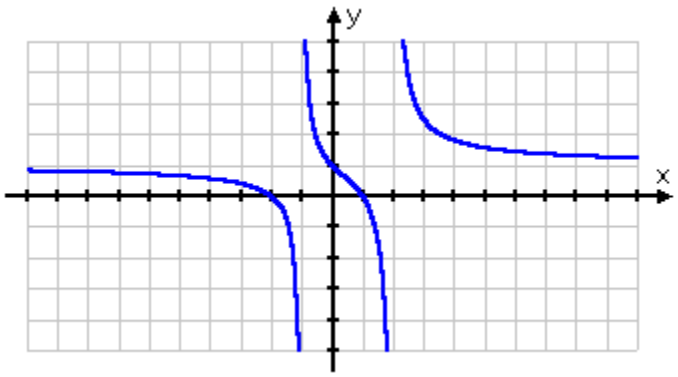
Set the denominator equal to 0 and solve. In this case, we are working with a quadratic equation so you will factor it and solve for the variable.

In this example, x ≠ -1 or 2

The domain consists of the set of all real numbers except -1 and 2.

{x|x ≠ -1 and x ≠ 2}

The range of this function is a little tricky. You would want to graph the function to determine the range of the function. The range is all real numbers.



Example:

$$y = -\sqrt{-2x + 3}$$

In this problem, we do not want a negative number under the square root. We will set the equation under the radical to x ≥ 0.

We end up with x ≥ 3/2.

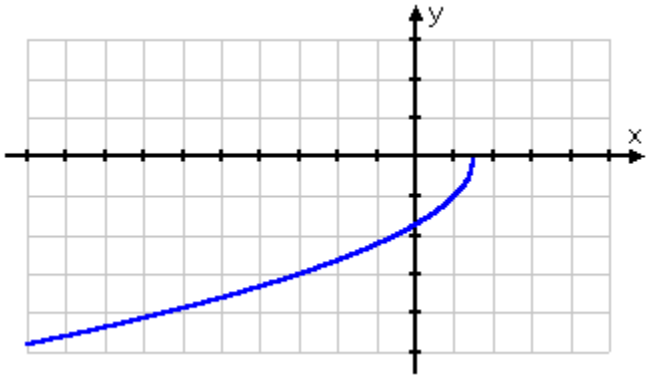
Domain is all numbers greater than or equal to 3/2.

$$-2x + 3 \geq 0$$

$$-2x \geq -3$$

$$x \geq \frac{3}{2}$$

To find the range, graph the function. The range is y ≤ 0.



Summary

When there is a denominator involved in a function, you must find all values that would make the denominator zero. Set any denominator equal to zero and solve. If you are working with a square root, you do not want to have a negative number under the radical so you would set the equation under the radical to greater than or equal to 0.