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FINDING THE DOMAIN & RANGE

Definition of Domain: the set of all possible x-values which will make the function "work", and will give real y-values.

Example: $g(x) = \{(3,5), (-2,7), (8,0)\}$ The x values make up the domain. The domain is {-2, 3, 8}. The values are arranged in numerical order.

HOW TO FIND THE DOMAIN:

1. Radicals of even root: the radicand must be a positive or zero, so to find what x ***can*** be, set the radicand to ≥ zero

$y = \sqrt{x-4}$
$x - 4 \geq 0$
$x \geq 4$
Domain is $[4, \infty)$

$y = \sqrt{x^2 + 7x + 12}$
$x^2 + 7x + 12 \geq 0$
$(x+3)(x+4) \geq 0$
Domain is $(-\infty, -4] \cup [-3, \infty)$

2. Rational Expressions: the denominator can never equal zero, so set the denominator to zero to find what x ***cannot*** be

$f(x) = \frac{3x+1}{x-2}$
$x - 2 = 0$
$x = 2$ ... so x *cannot* be 2
Domain is all #'s except 2
Interval is $(-\infty, 2) \cup (2, \infty)$

$g(x) = \frac{4}{x^2-9}$
$x^2 - 9 = 0$
$(x-3)(x+3) = 0$
$x = 3$ or $x = -3$ ... so x *cannot* be 3 or -3
Domain is all #'s except -3 and 3
The interval is $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

3. The domain is $(-\infty, \infty)$ for the following:

a) any linear function, such as $f(x) = 3x + 7$

b) any quadratic equation, such as $y = x^2 + 2x - 3$

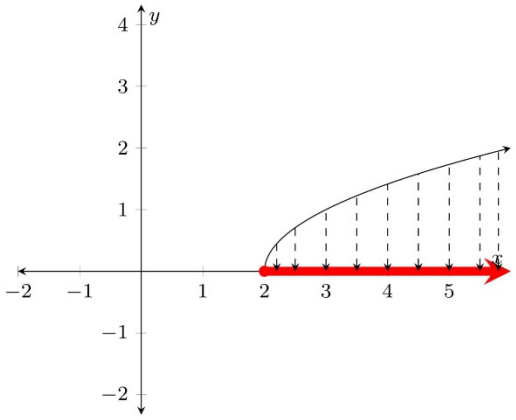
c) any polynomial equation where x is within the absolute value bars, such as $y = |-3x + 7|$

d) any equation where x is under a radical with an <u>odd</u> root, such as $y = \sqrt[3]{x-6}$

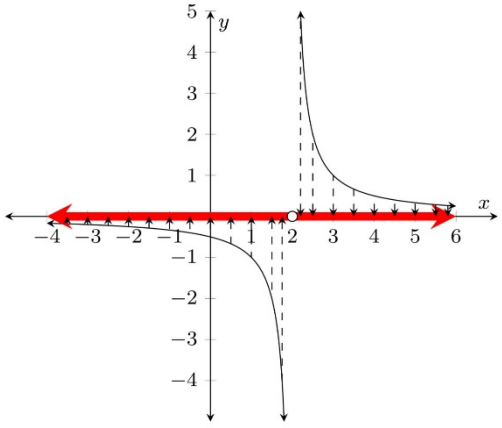
f) any linear inequality, such as $y > x + 8$

g) any polynomial function, such as $y = 4x^3 + 6x^2 - 5$

4. Looking at the graph, examine the x-values from left to right



Domain is [2, ∞)



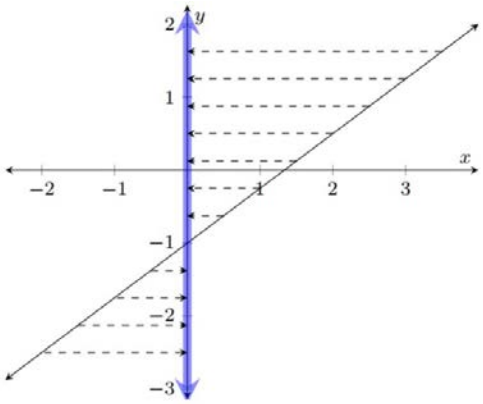
Domain is (-∞,2) U (2,∞)

Definition of Range: the set of all possible y-values the relation can produce from the x-values.

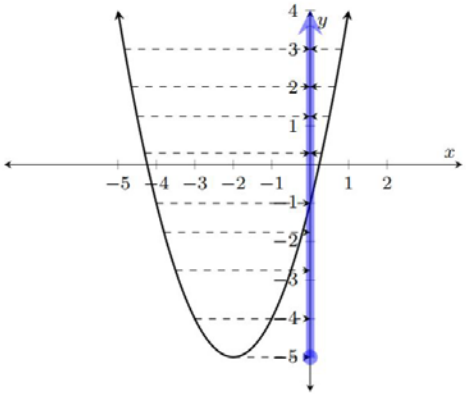
Examples: $f(x) = \{(3,5), (-2,7), (8,0)\}$ The y values make up the range. The range is {0, 5, 7}. The values are arranged in numerical order.

HOW TO FIND THE RANGE:

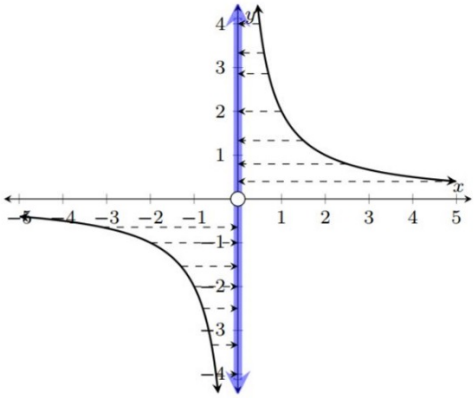
1. The easiest way is to look at the GRAPH, examine the y-values from bottom to top



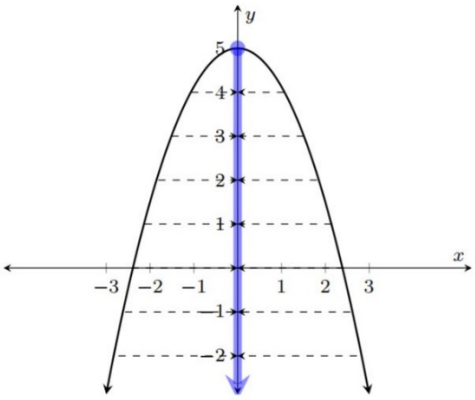
Range is (-∞,∞)



Range is [-5,∞)



Range is (-∞,0) U (0,∞)



Range is (-∞,5]

2. Algebraically: There is no set way to find the range algebraically. However, one strategy that works most of the time is to find the domain of the inverse function (if it exists). First, swap the x and y variables everywhere they appear in the equation and then solve for y. Find the ***domain*** of this new equation and it will be the range of the original.