

Algebra 2

Unit 1 Lesson 6 - Function Types and the Vertical Line Test

- Define a "function" and the "vertical line test"
- Introduce the following function types
 - > Linear Functions
 - > Quadratic Function
 - > Cubic Functions
 - > Polynomials
 - > Radical Functions
 - > Rational Exponent Functions
 - > Rational Functions
 - > Logarithmic Functions
 - > Exponential Functions

Lesson 6 - Functions and Function Types

Definitions:

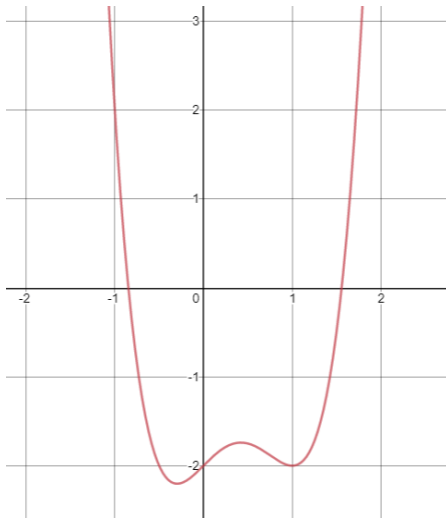
$$x = y^2 \quad y = y^2$$

Function: An equation for which any x that can be plugged into the equation will yield exactly one y out of the equation.

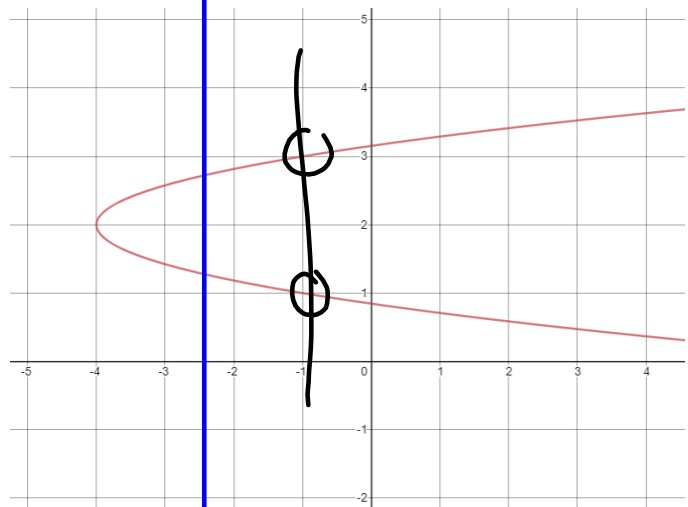
Vertical Line Test Given a graphed line/curve, if you can draw a vertical line anywhere that will intersect the curve at more than one point, it is Not a function.

Ex: Determine if the following graphed curves are functions.

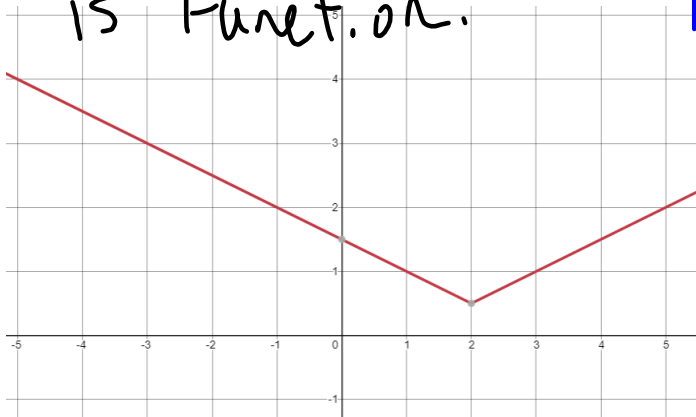
Is function



Not function



is Function.



Function Types:

Today we will introduce most of the function types we will be solving/graphing throughout the year. Your job will be to identify which equation/function is which.

For all of the function types today, y must only be raised to the first power.

Linear Functions: an equation where x is raised only to the first power, with no other powers of x. (x also cannot be inside other complicated operations like logs or square roots)

$$y = \frac{1}{2}x - 3 \quad \checkmark \quad 2y - 3x = 6x - 10 \quad \checkmark \quad y = 3x^{(2)} - 7 \quad \times$$

Quadratic Functions: an equation where x is raised to positive whole number powers with the highest power being 2.

$$6 - y = x^2 - 7 \quad \checkmark \quad y = -3x + 5x^2 - 9 \quad \checkmark$$

$$y^{(2)} = 2x^2 + x - 5 \quad \times$$

Cubic Functions: An equation where x has positive whole number powers where the highest power is 3.

$$x^2 - 4x^3 = y - x \qquad y = 2(x - 4)^3 + 5$$

$$x = 2y - 3y^2 + 4x^3$$



Polynomials: An equation where x's can have any powers so long as all of the numbers are real numbers and the powers are positive whole numbers. (Linear, Quadratic, and Cubic functions are all polynomials, technically)

$$y = \frac{1}{2}x^3 - 16x^5 + 12x^{10} - 5$$



$$y = \frac{1}{3}x^4 + \frac{1}{8}x^{-6} + x^3 + 1$$



Radical Functions: an equation where x is underneath a radical and has no power other than 1 anywhere. (commonly referred to as a square root signs, but square roots are not the only radicals)

$$y = \sqrt{x-2} + 5$$

✓

$$y = x^2 - \sqrt{x} + 6$$

✗

$$y + 10 = -\frac{1}{2}\sqrt{2x+1}$$

✓

Rational Exponent Functions: an equation where you have a single x that is raised to a positive fraction power (after simplifying).

$$y = 5x^{\frac{2}{3}} - 1$$

✓

$$y = (-3x) + 2x^{\frac{3}{4}}$$

✗

Rational Functions: An equation where there are x's in the numerator and denominator of a fraction (may be more than 1 fraction)

$$y = \frac{x+1}{x-3}$$

✓

$$y = \frac{x^2 + 5x + 10}{x^2 - x + 2}$$

✓

Logarithmic Functions: An equation where you have x inside of a logarithm. (x can be raised to powers inside the log)

$$y = \log_3(x-2) + 8$$

✓

$$4 \begin{bmatrix} 2 & 1 \\ -1 & 0 \end{bmatrix}$$

$$y = \frac{1}{2} \ln x - 3$$

ln
log_e

Exponential Functions: An equation where you have x inside the power of a positive real number that's not 1.

$$y = 2(7)^{x+1}$$

✓

$$y = \left(\frac{1}{2}\right)^x - 10$$

✓

Homework:

Worksheet

There will be a 25 point quiz over this section. Make sure you can properly identify all of the function types we covered, as well as use the vertical line test to determine if a graph is a function.