

2.1 Functions

GOALS:

1. Consider equations in 2 variables.
2. Understand the definition of a function.
3. Understand the role of a place-holder in evaluating a function.
4. Evaluate functions for both numerical values and algebraic expressions.
5. Determine the domain and range of functions.

Study 2.1 CVC # 1-11

1,5,9,13, ..., 25; 27-45, 49, 55-87

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2.1 Functions

Equations in 1 variable

$$5x^4 - 20x^2 = 0$$

$$x + 1 = 9x^3 + 9x^2$$

$$\sqrt{20 - 8x} = x$$

$$|x - 2| = 9$$

Equations in 2 variables

$$y = 5x^4 - 20x^2$$

$$y = 9x^3 + 9x^2 - x - 1$$

$$y = \sqrt{20 - 8x} - x$$

$$y = |x - 2| - 9$$

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2.1 Functions

Equations in 2 variables

$$y = x^2$$

$$x - y^2 = 0$$

$$x^2 + y^2 = 25$$

$$z = |r - 2| - 9$$

$$y = 2x + 3(x - 2)$$

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2.1 Functions

Relation: any set of ordered pairs

in algebra: involves variables and a rule that relates the variables

(x, y) or (independent variable, dependent variable)

Function: set of ordered pairs (x, y),
in which

each value of x
results in
EXACTLY one value of y.

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2.1 Functions

Function: set of ordered pairs (x, y) ,
in which each value of x results in
EXACTLY one value of y .

Is y a function of x ? yes or no

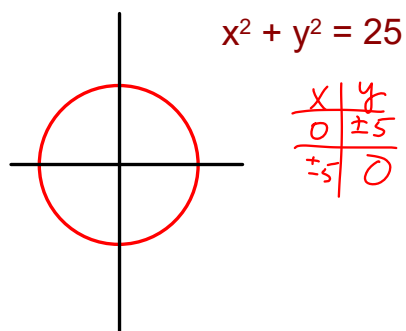
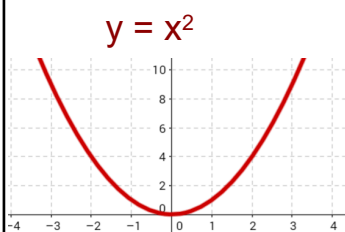
x	y
$y = x^2$	yes or no
$x^2 + y^2 = 25$	yes or no
$y = 2x + 3(x - 2)$	yes or no
$x - y^2 = 0$	yes or no

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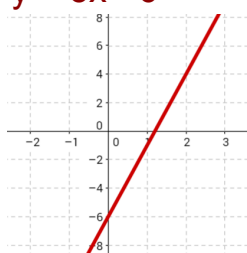
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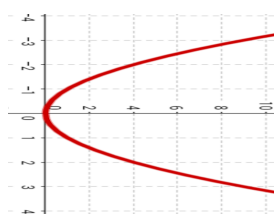
2.1 Functions



$y = 2x + 3(x - 2)$
 $y = 5x - 6$



$x - y^2 = 0$



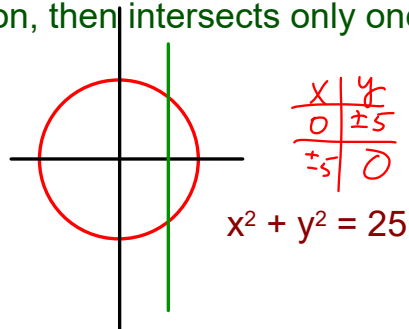
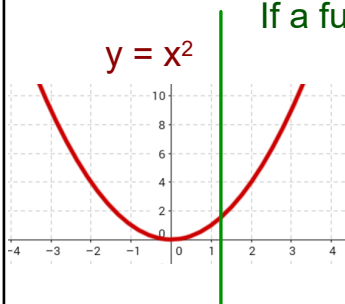
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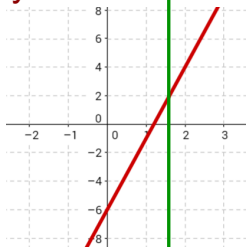
2.1 Functions

Use Vertical Line Test:
If a function, then intersects only once.

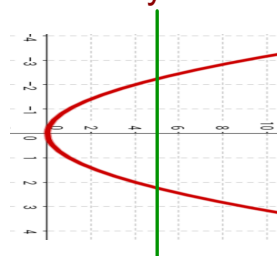


$$y = 2x + 3(x - 2)$$

$$y = 5x - 6$$



$$x - y^2 = 0$$



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2.1 Functions

Function: set of ordered pairs (x, y) ,
in which each value of x results in
EXACTLY one value of y .

Is y a function of x ? yes or no

$y = x^2$	yes or no
$x^2 + y^2 = 25$	yes or no
$y = 2x + 3(x - 2)$	yes or no
$x - y^2 = 0$	yes or no

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2.1 Functions

Domain: all values of x that result in a real number for y
all values of the independent variable that result in a real number for the dependent variable.

Range: all of the possible values of y
all of the possible values of the dependent variable

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2.1 Functions

Find the domain and the range for each.

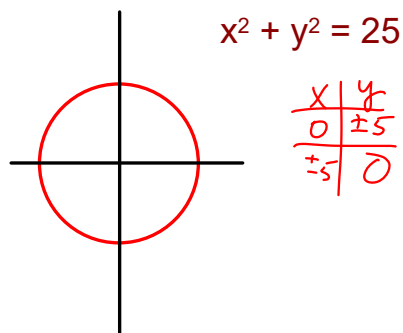
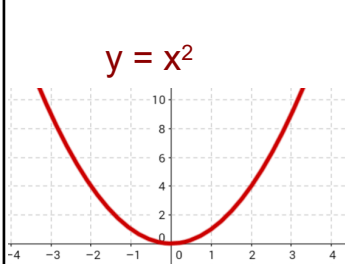
	Domain	Range
$y = x^2$		
$x^2 + y^2 = 25$		
$y = 2x + 3(x - 2)$		
$x - y^2 = 0$		

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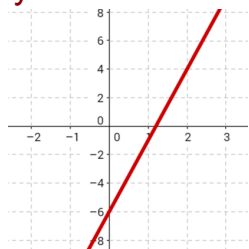
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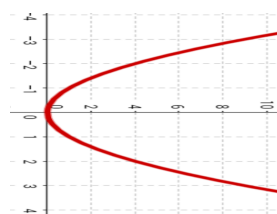
2.1 Functions



$y = 2x + 3(x - 2)$
 $y = 5x - 6$



$x - y^2 = 0$



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2.1 Functions

Find the domain and the range for each.

	Domain	Range
$y = x^2$	all x	$y \geq 0$
$x^2 + y^2 = 25$	$-5 \leq x \leq 5$	$-5 \leq y \leq 5$
$y = 2x + 3(x - 2)$	all x	all y
$x - y^2 = 0$	$x \geq 0$	all y

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = 3x + 7 \quad F: f(4)$$

$$\text{Step 1. } f(\quad) = 3(\quad) + 7 \quad \text{placeholder}$$

$$\text{Step 2. } f(4) = 3(4) + 7$$

$$\text{Step 3. } f(4) = 12 + 7 = 19$$

$$f(4) = 19$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = 3x + 7 \quad F: f(-4)$$

$$\text{Step 1. } f(\quad) = 3(\quad) + 7 \quad \text{placeholder}$$

$$\text{Step 2. } f(\quad) = 3(\quad) + 7$$

$$\text{Step 3. } f(\quad) = \underline{\quad} + 7$$

$$f(\quad) = \underline{\quad}$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = 3x + 7 \quad F: f(-4)$$

Step 1. $f(\quad) = 3(\quad) + 7$ placeholder

Step 2. $f(-4) = 3(-4) + 7$

Step 3. $f(-4) = -12 + 7$

$$f(-4) = -5$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = 3x + 7 \quad F: f(x+1)$$

Step 1. $f(\quad) = 3(\quad) + 7$ placeholder

Step 2. $f(\quad) = 3(\quad) + 7$

Step 3. $f(\quad) = \underline{\hspace{2cm}} + 7$

$$f(\quad) = \underline{\hspace{2cm}}$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = 3x + 7$$

$$F: f(x+1)$$

$$\text{Step 1. } f(\quad) = 3(\quad) + 7 \quad \text{placeholder}$$

$$\text{Step 2. } f(x+1) = 3(x+1) + 7$$

$$\text{Step 3. } f(x+1) = 3x + 3 + 7$$

$$f(x+1) = 3x + 10$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = x^3 - x + 1$$

$$F: f(3)$$

$$\text{Step 1. } f(\quad) = (\quad)^3 - (\quad) + 1 \quad \text{placeholder}$$

$$\text{Step 2. } f(3) = (3)^3 - (3) + 1$$

$$\text{Step 3. } f(3) = \underline{\quad} - \underline{\quad} + 1$$

$$f(3) = \underline{\quad}$$

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2.1 Functions

To Evaluate Functions:

1. Use placeholders to display the rule of the function.
2. Substitute the value into the placeholder.
3. Simplify the result.

$$G: f(x) = x^3 - x + 1 \quad F: f(3)$$

$$\text{Step 1. } f(\quad) = (\quad)^3 - (\quad) + 1 \quad \text{placeholder}$$

$$\text{Step 2. } f(3) = (3)^3 - (3) + 1$$

$$\text{Step 3. } f(3) = 27 - 3 + 1$$

$$f(3) = 25$$

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2.1 Functions

PRACTICE

$$G: g(x) = x^2 - 10x - 3 \quad F: g(-1)$$

$$G: f(r) = \sqrt{25 - r} - 6 \quad F: f(16)$$

$$G: f(x) = \frac{4x^3 + 1}{x^3}, \quad x \neq 0 \quad F: f(-x)$$

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2.1 Functions

$$G: g(x) = x^2 - 10x - 3 \quad F: g(-1)$$

$$g(\quad) = (\quad)^2 - 10(\quad) - 3$$

$$g(\quad) = \underline{\hspace{2cm}}$$

$$g(\quad) = \underline{\hspace{2cm}}$$

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2.1 Functions

$$G: g(x) = x^2 - 10x - 3 \quad F: g(-1)$$

$$g(\quad) = (\quad)^2 - 10(\quad) - 3$$

$$g(-1) = (-1)^2 - 10(-1) - 3$$

$$g(-1) = 1 + 10 - 3$$

$$g(-1) = 8$$

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2.1 Functions

$$G: f(r) = \sqrt{25 - r} - 6 \quad F: f(16)$$

$$f(\quad) = \sqrt{25 - (\quad)} - 6$$

$$f(\quad) = \sqrt{\quad} - 6$$

$$f(\quad) = \underline{\hspace{2cm}}$$

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2.1 Functions

$$G: f(r) = \sqrt{25 - r} - 6 \quad F: f(16)$$

$$f(\quad) = \sqrt{25 - (\quad)} - 6$$

$$f(16) = \sqrt{25 - (16)} - 6$$

$$f(16) = \sqrt{9} - 6$$

$$f(16) = 3 - 6 = -3$$

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2.1 Functions

$$G: f(x) = \frac{4x^3 + 1}{x^3}, \quad x \neq 0 \quad F: f(-x)$$

$$f(\quad) = \frac{4(\quad)^3 + 1}{(\quad)^3}, \quad x \neq 0$$

$$f(\quad) = \underline{\hspace{2cm}}$$

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2.1 Functions

$$G: f(x) = \frac{4x^3 + 1}{x^3}, \quad x \neq 0 \quad F: f(-x)$$

$$f(\quad) = \frac{4(\quad)^3 + 1}{(\quad)^3}, \quad x \neq 0$$

$$f(-x) = \frac{4(-x)^3 + 1}{(-x)^3}$$

$$f(-x) = \frac{4(-x^3) + 1}{-x^3}$$

$$f(-x) = \frac{-4x^3 + 1}{-x^3}$$

$$f(-x) = \frac{4x^3 - 1}{x^3} \quad \text{or} \quad 4 - \frac{1}{x^3}, \quad x \neq 0$$

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2.1 Functions

$$G: g(x) = x^2 - 10x - 3 \quad F: g(x+2)$$

$$g(\quad) = (\quad)^2 - 10(\quad) - 3$$

$$g(\quad) = \underline{\hspace{2cm}}$$

$$g(\quad) = \underline{\hspace{2cm}}$$

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2.1 Functions

$$G: g(x) = x^2 - 10x - 3 \quad F: g(x+2)$$

$$g(\quad) = (\quad)^2 - 10(\quad) - 3$$

$$g(x+2) = (x+2)^2 - 10(x+2) - 3$$

$$g(x+2) = x^2 + 4x + 4 - 10x - 20 - 3$$

$$g(x+2) = x^2 - 6x - 19$$

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