

Unit 1 - Functions

Sep 7/2016

Review: Functions, Domain, and Range

A relation is any set of ordered pairs (x, y) relating an independent variable (typically x) to a dependent variable (typically y).

For example:

(a) $y = 3x + 2$ is the equation for a set of points.

(b) $\{(0, 1), (3, 4), (2, -5)\}$ is a set of ordered pairs.

Domain is the set of all possible values for the independent variable.

Range is the set of all possible values for the dependent variable.

Feb 12-9:14 PM

A function is a special type of relation where each value of the independent variable yields only a single value of the dependent variable.

For example:

- (1) Set Notation: No x -value is repeated
- (2) Graph: If any vertical line passes through more than one point on the graph of a relation, it is not a function. This is known as the vertical line test.
- (3) Equation: Rearrange for y and ensure there is only a single value produced for any x .

Feb 21-9:54 PM

Set Notation Examples:

"the set of all x , where x is a member of the real number set, such that x is less than 3"

$$\{x \in \mathbb{R} \mid x < 3\}$$

↑ type of number
↑ condition(s)

Ex. Describe each set

(a) $\{y \in \mathbb{Z} \mid -5 \leq y < 3\}$

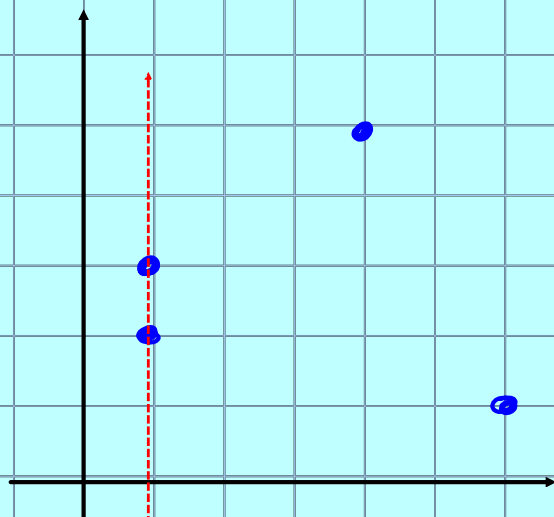
$-5, -4, -3, -2, -1, 0, 1, 2$

(b) $\{z \in \mathbb{R} \mid z = \pi k, k \in \mathbb{Z}\}$

$\dots, -2\pi, -\pi, 0, \pi, 2\pi, \dots$

Aug 16-1:05 PM

Ex. Consider $f = \{(1,2), (1,3), (4,5), (6,1)\}$. Is f a function?



$x = 1$ is repeated
 \therefore NOT a function

fail vertical line test

Feb 21-10:02 PM

Ex. Consider $f = \{ (1,2), (1,3), (4,5), (6,1) \}$. Is f a function?

This relation is not a function, since the independent value of $x = 1$ has two possible dependent values, $y = 2$ and $y = 3$.

After plotting the points, it also fails the vertical line test.

Graphically, this relation fails the vertical line test. If a vertical line can be drawn through more than one point on the graph of the relation, then it is not a function.

Feb 21-10:02 PM

If any vertical line passes through more than one point on the graph of a relation, it is not a function. This is known as the vertical line test.

Which graphs are functions?

a)

b)

c)

d)

e)

f)

Feb 21-9:59 PM

Ex. Does the equation represent a function?

(a) $\frac{x}{y} = 1 + x$ (b) $x^2 + y^2 = 9$

$$\frac{x = y(1+x)}{1+x} \quad \frac{y}{1+x} = \frac{x}{1+x}$$

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

$$x \neq -1$$

$$x = y + xy$$

$$x - xy = y$$

$$x(1-y) = y$$

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

$$y \neq 1$$

$$y^2 = 9 - x^2$$

$$y = \pm \sqrt{9 - x^2}$$

Some x -values yield two y -values
 \therefore not a function

$D = \{x \in \mathbb{R} \mid -3 \leq x \leq 3\}$

Aug 13-6:42 PM

The equation of a relation which is a function can be written using a special notation, **function notation**.

$$f(x) = 3x + 2$$

"the result depends on x and is defined as $3x + 2$ "

On a graph, the y -axis is used to represent the value of the function, which we write as

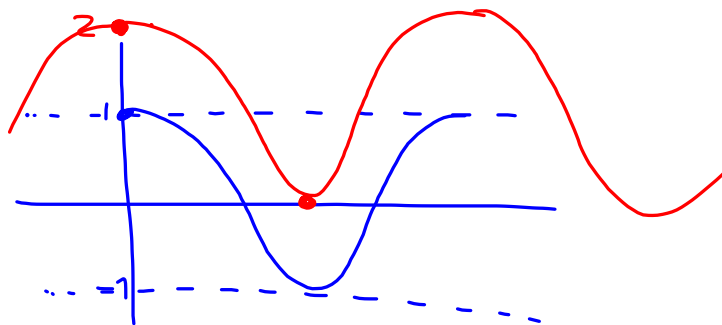
$$y = f(x)$$

"the variable y is a function of the variable x "

Assigned Work:

p.11 # 1, 2, 3, 4, 6, 8, 11, 12, 14

$$2.(d) y = \cos x + 1$$

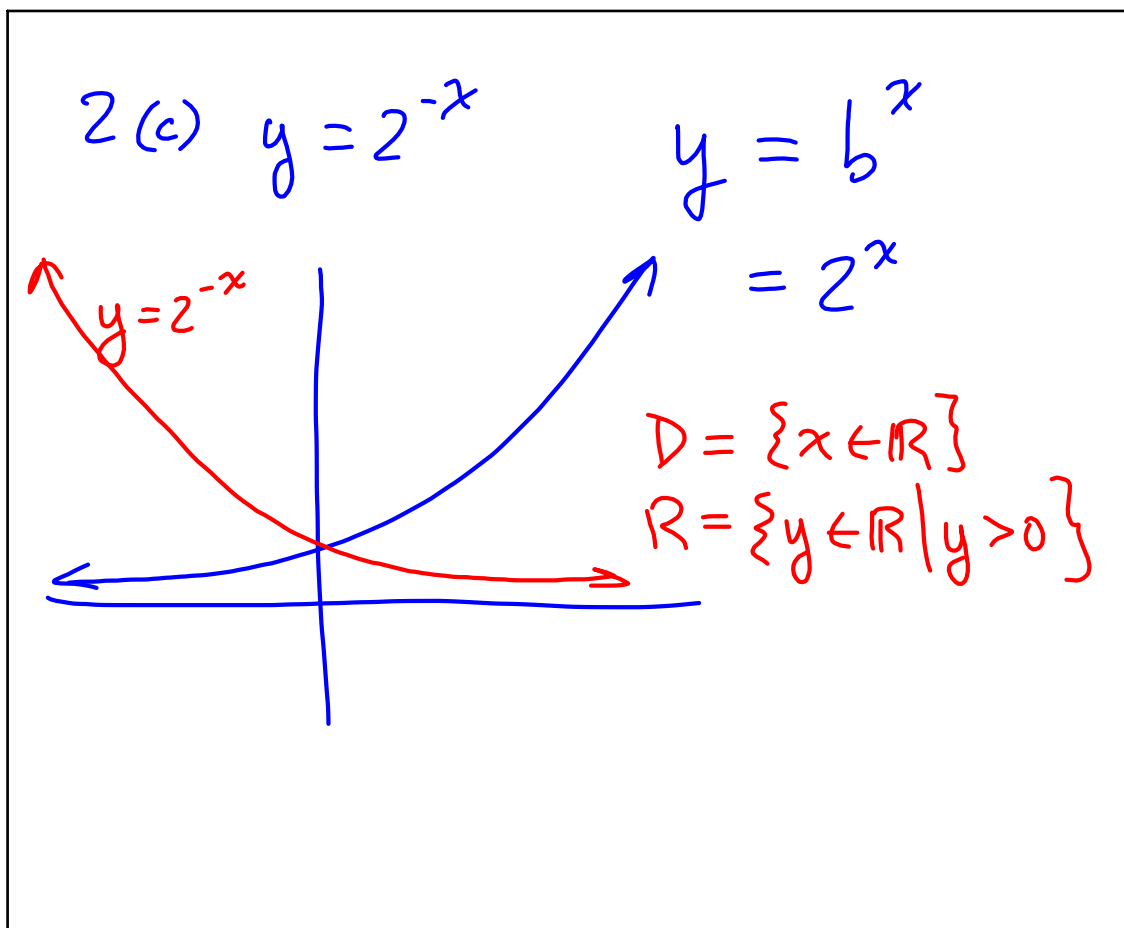


$$D = \{x \in \mathbb{R}\}$$

$$R = \{y \in \mathbb{R} \mid 0 \leq y \leq 2\}$$

Feb 10-10:23 PM

Sep 8-2:12 PM



Sep 8-1:58 PM

6. (a) $l = 2w \rightarrow \frac{l}{2} = w$

$$f(l) = l + \underline{w}$$

$$= l + \frac{l}{2}$$

$$= \frac{3l}{2}$$

(d) $12 = \frac{3l}{2}$
 $24 = 3l$
 $l = 8$

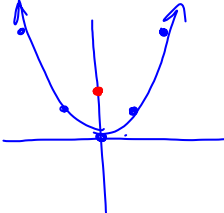
$w = \frac{l}{2}$
 $= \frac{8}{2}$
 $= 4$

Sep 8-2:00 PM

11.

x	y	Δy	$\Delta^2 y$
0	3		
1	4	1	
2	7	3	2
3	12	5	2
4	19	7	2
5	28	9	2

quadratic

$$y = a(x-p)^2 + q$$


$$y = x^2 + 3$$

$$g(3) - g(2) = g(3-2)?$$

$$LS = g(3) - g(2) \quad RS = g(3-2)$$

$$= 12 - 7 \quad = g(1)$$

$$= 5 \quad = 4$$

$LS \neq RS$

Sep 8-2:04 PM

12. $f(x)$

$$f(4) = 7$$

$$f(6) = 1 + 2 + 3 + 6 \quad 6 = 2 \times 3$$

$$= 1 \times 6$$

$$f(7) = 1 + 7$$

$$f(8) = 1 + 2 + 4 + 8$$

$$f(15) = 1 + 3 + 5 + 15$$

Sep 8-2:12 PM

Attachments

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