Unit 1 - Functions

Sep 2/2014

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).

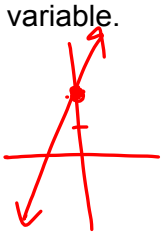
For example:

(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. $D_b = \{0, 3, 2\}$

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



$R_a = \{y \mid y \in \mathbb{R}\}$

OR

$R_a = \{y \in \mathbb{R}\}$

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: domain

(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.

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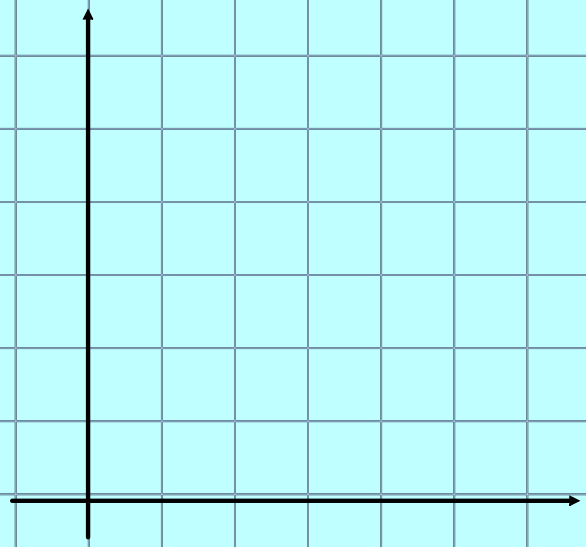
Consider { (1,2), (1,3), (4,5), (6,1) }



This relation is <u>not a function, since the</u> 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.

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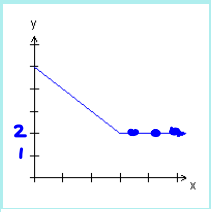
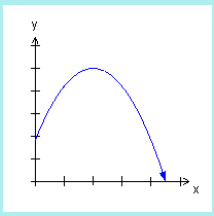
If any vertical line passes through more than one point on the graph of a relation, it is not a function. This is known as the <u>vertical line test</u>.

Which graphs are functions?

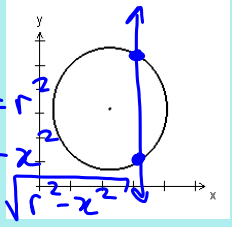
a)



b)



c)

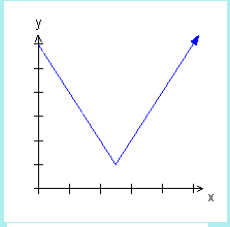


$x^2+y^2=r^2$

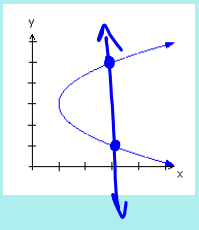
$y^2=r^2-x^2$

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

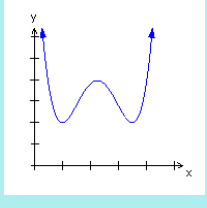
d)



e)



f)



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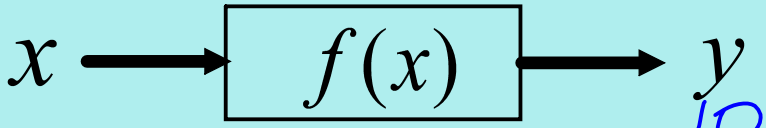
A function, $y = f(x)$, is like a machine:

input values of x...



3 → 3

Three

T

Ten

10

... and the outputs are values of y

$f(3) = 10$

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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"

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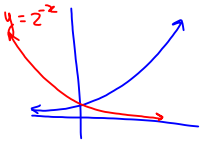
Assigned Work:

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

f c b
c d
e

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

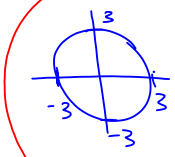


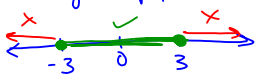
$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R} \mid y > 0\}$

(e) $x^2 + y^2 = 9 \rightarrow y^2 = 9 - x^2$

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





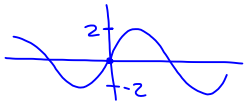
$D = \{x \in \mathbb{R} \mid -3 \le x \le 3\}$

$x^2 = 9 - y^2$

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

$R = \{y \in \mathbb{R} \mid -3 \le y \le 3\}$

(f) $y = 2\sin x$



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

$R = \{y \in \mathbb{R} \mid -2 \le y \le 2\}$

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4 cd

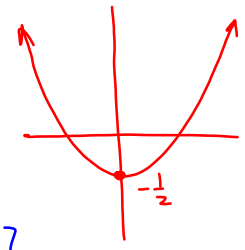
(c) $x^2 = 2y + 1$ $D = \{x \in \mathbb{R}\}$

$x^2 - 1 = 2y$

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

> 0 opens up

y-int



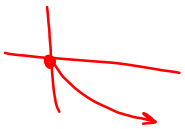
$R = \{y \in \mathbb{R} \mid y \ge -\frac{1}{2}\}$

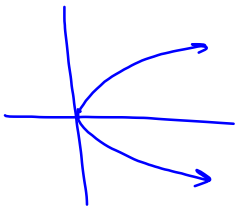
(d) $x = y^2$

$y = \pm\sqrt{x}$

$y = \sqrt{x}$

$y = -\sqrt{x}$





$D = \{x \in \mathbb{R} \mid x \ge 0\}$

$R = \{y \in \mathbb{R}\}$

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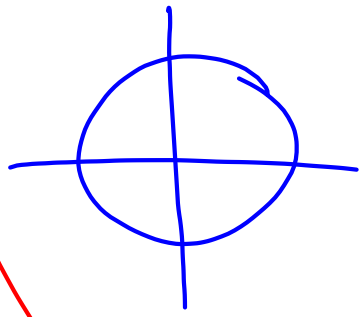
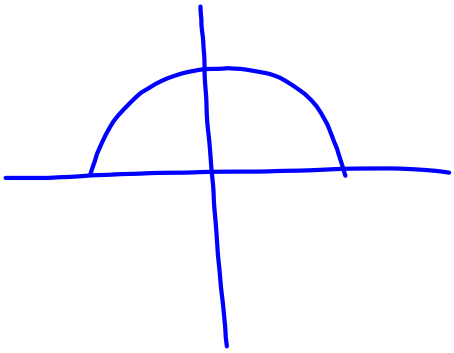
14. $x^2 + y^2 = 25$



$y^2 = 25 - x^2$

$y = \pm\sqrt{25 - x^2}$

$y = \sqrt{25 - x^2}$



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Attachments

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