Unit 2 - Functions

Feb 26/2019

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.

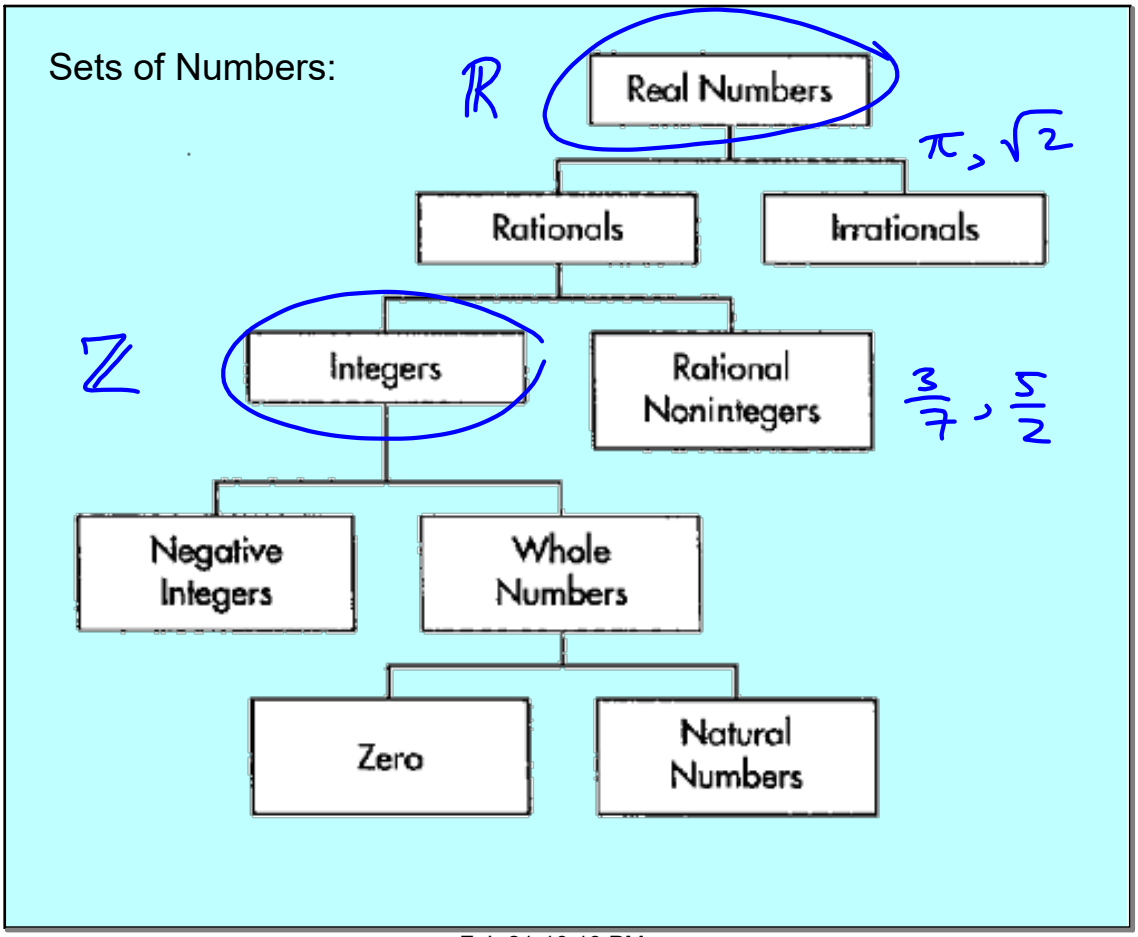
(b) { (0,1), (3, 4), (2, -5) } is a set of ordered pairs.

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

Sets of Numbers:



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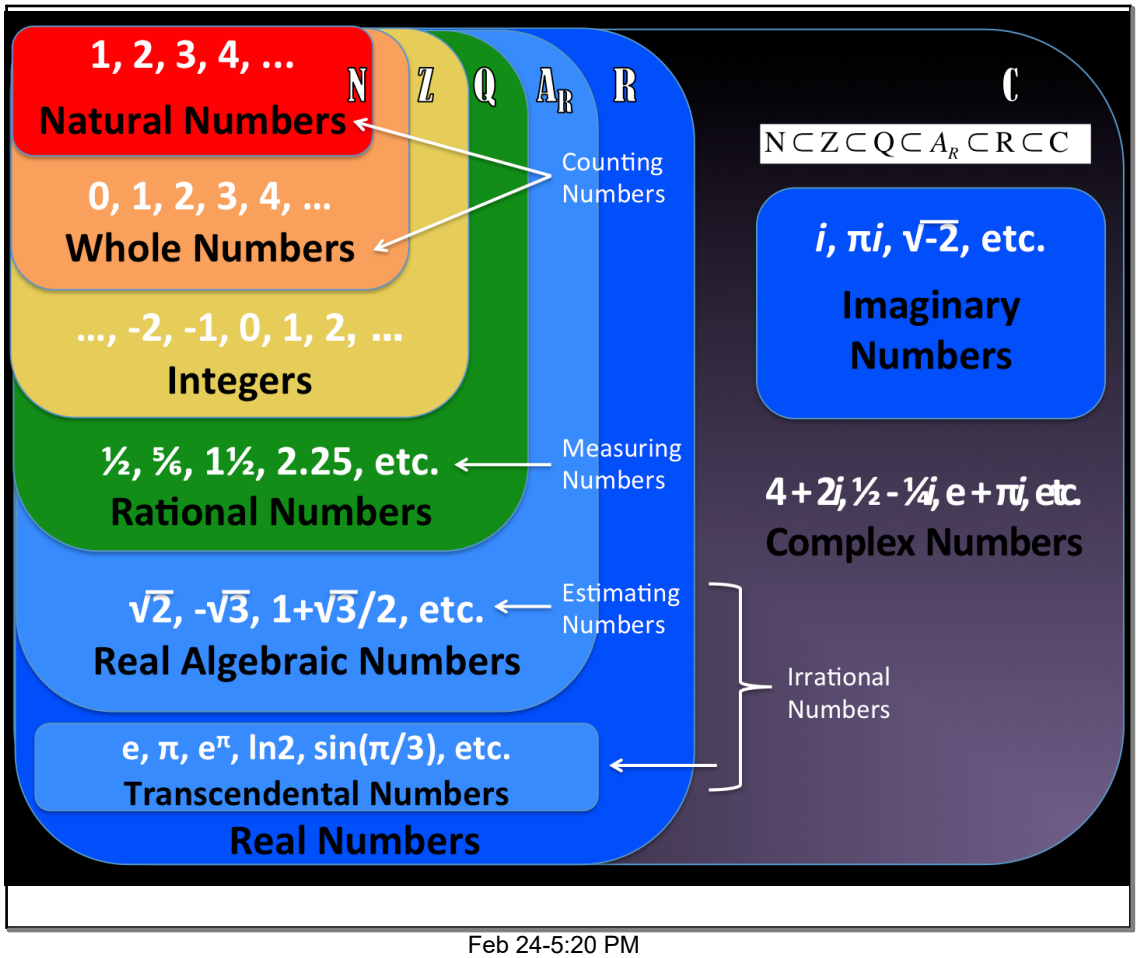

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Domain is the set of all possible values for the independent variable.

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

Ex.1 State the domain and range for
{ (0, 1), (3, 4), (2, -5) }

$D = \{0, 3, 2\}$ ✓

$= \{0, 2, 3\}$ ✓ C+

C

C!

$R = \{-5, 1, 4\}$

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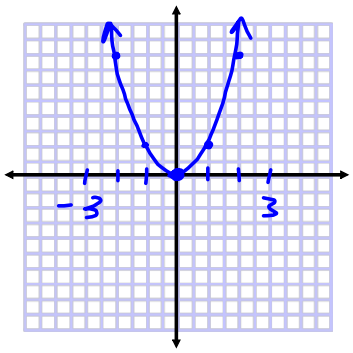
Sketch a

Ex.2 Graph and state the domain and range for each relation.

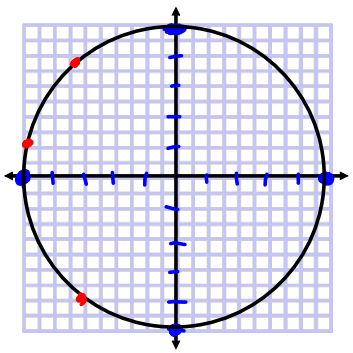
(a) $y = x^2$



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

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

(b) $x^2 + y^2 = 25$



$r^2 = 25$

$r = \pm\sqrt{25}$

$r = \pm 5$

$r > 0$

$r = 5$

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

$D = \{x \in \mathbb{R} \mid -5 \leq x \leq 5\}$

$R = \{y \in \mathbb{R} \mid -5 \leq y \leq 5\}$

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Set Notation:

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

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

type of number

condition(s)

$\in$ → "member of"

$\mathbb{R}$ → "real numbers"

$|$ → "such that"

$\mathbb{Z}$ → integers

Aug 16-1:05 PM

A function is a special type of relation where each value of x yields only a single value of y.

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.

Ex.3 Determine which relations are functions.

(a) { (1,2), (3,1), (4,2), (7,2) } (b) $x^2 + y^2 = 25$

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Ex.3 Determine which relations are functions.

(a) { (1,2), (3,1), (4,2), (7,2) }

$D = \{1, 3, 4, 7\}$ (no repeats)

$\therefore$ is a function

(b) $x^2 + y^2 = 25$

$y^2 = 25 - x^2$

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

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

$\therefore$ each value of x produces 2 values for y

$\therefore$ not a function

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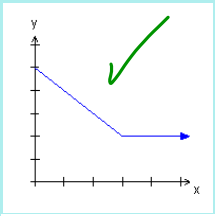
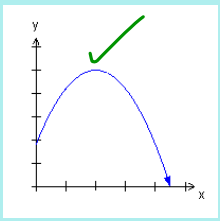
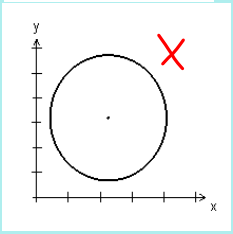
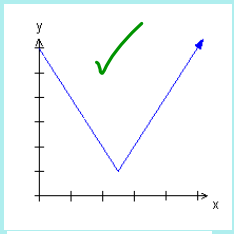
If any vertical line passes through more than one point on the graph of a relation, it is not a function. This is known as the vertical line test.

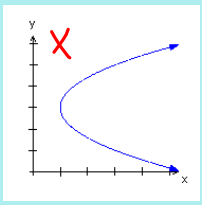
Ex.4 Which graphs are functions?

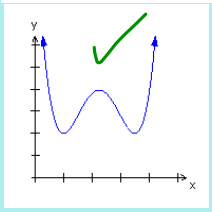
a) 

b) 

c) 

d) 

e) 

f) 

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

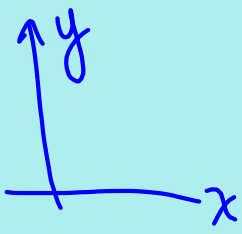
$$f(x) = 3x + 2$$

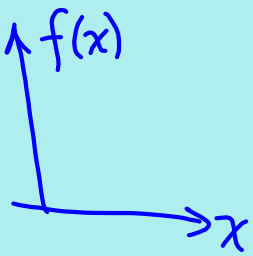
"the result depends on x and is defined as 3x + 2"

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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x-y notation	function notation
$y = 3x + 2$	$f(x) = 3x + 2$
sub $x = 1$ $y = 3(1) + 2$ $= 5$	$f(1) = 3(1) + 2$ $= 5$ $P(1,5)$

Ex.4 If $f(x) = 3x + 2$, evaluate:

a) $f(5)$

$= 3(5) + 2$

$= 17$

$P(5,17)$

b) $f(-1)$

$= 3(-1) + 2$

$= -1$

c) $f(2a)$

$= 3(2a) + 2$

$= 6a + 2$

$P(2a, 6a+2)$

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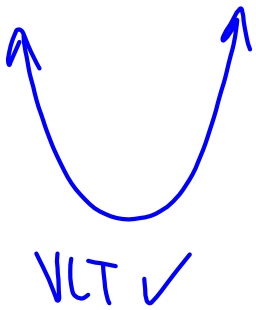
Assigned Work:

p.178 # 1 - 3, 5, (6 - 10)(ad), 12, 15, 18, 21, 26, 32

b b

5 (b) $y = 2x^2 + 3x - 5$



VLT ✓

for each x, one y

Sub $x = 0$, $y = -5$

$x = 1$, $y = 0$

$x = 2$, $y = 9$

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15. (a) t, v $\quad d = vt$

$\frac{d}{v} = \frac{vt}{v}$

$t = \frac{d}{v}$

for each speed, there is one time

$\Rightarrow$ is a function

v is independent, t is dependent

(b) not a function

age	# CD
16	0
16	1000
12	25
45	25

(c) # tickets sold independent vs revenue dependent.

is a function

Feb 27-12:39 PM

18 (b)

$D = \{-2, 0, 0.5, 3\}$ input

$f(x) = 8x^2 - 4x + 7$

output?

$f(-2) = 8(-2)^2 - 4(-2) + 7$

$= 32 + 8 + 7$

$= 47$

$f(0) = 7 \quad f(0.5) = 7 \quad f(3) = 67$

$R = \{47, 7, 7, 67\}$ ✓ ©

$R = \{7, 47, 67\}$ ✓

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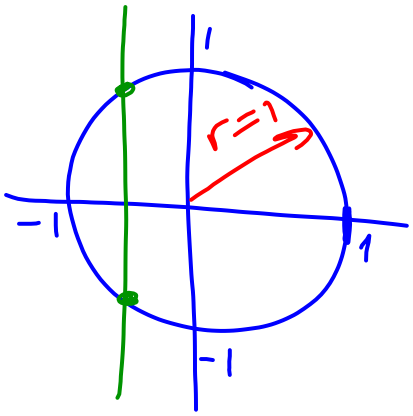
21. $x^2+y^2=1$

$r^2=1$

$r=\pm 1$

$r>0$

$r=1$



$D=\{x\in\mathbb{R} \mid -1\le x\le 1\}$

$R=\{y\in\mathbb{R} \mid -1\le y\le 1\}$

(b) not a function, fails VLT

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26. $f(x)=x^2+4x$

(a) what is x, if $f(x)=5$

$5=x^2+4x$

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

$0=(x+5)(x-1)$

$x=-5$ $\quad$ $x=1$

(b) $f(x)=-4 \Rightarrow -4=x^2+4x$

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32.

(a) $f(x) = 4x + 3$

$f(2a) = 4(2a) + 3$

$= 8a + 3$

(b) $f(x) = 2 - 3x$

$f(n+1) = 2 - 3(n+1)$

$= 2 - 3n - 3$

$= -3n - 1$

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Attachments

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