PreCalc th 9/8/16 1

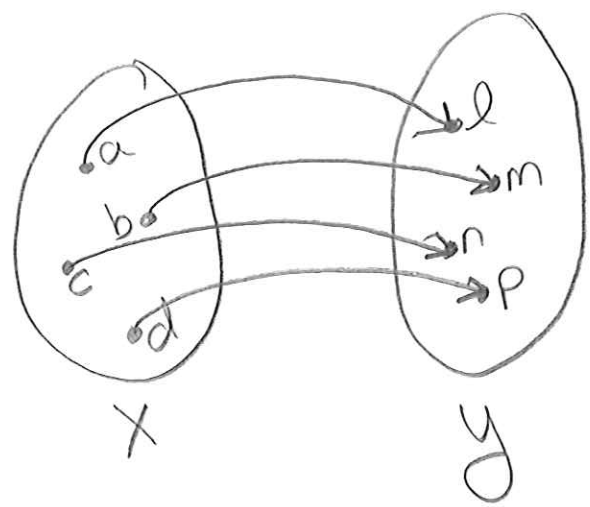
1.1. Functions

A relation is a correspondence between two sets.

* equations $y = 3x - 1$
* tables

x	-1	0	1	2	3
y	12	5	-2	4	-7

* set of points $S = \{(1,2),(3,4),(5,6)\}$
* maps



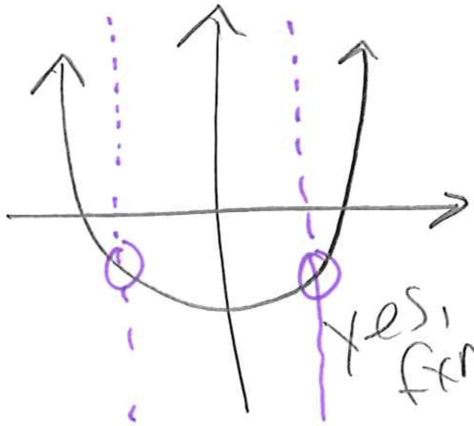
When is a relation a fxn?

A function (fxn) has exactly one output for each input.

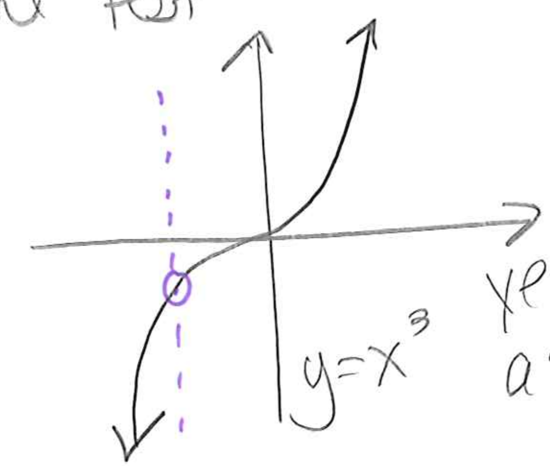
x : independent variable
y : dependent variable

$f(x) = y$ ex) $y = 3x - 1$
$f(x) = 3x - 1$

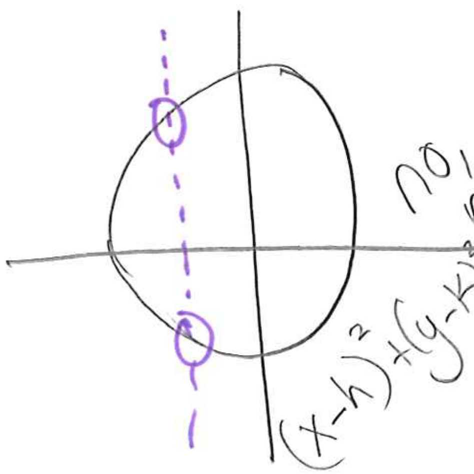
test graphs w/ vertical line test



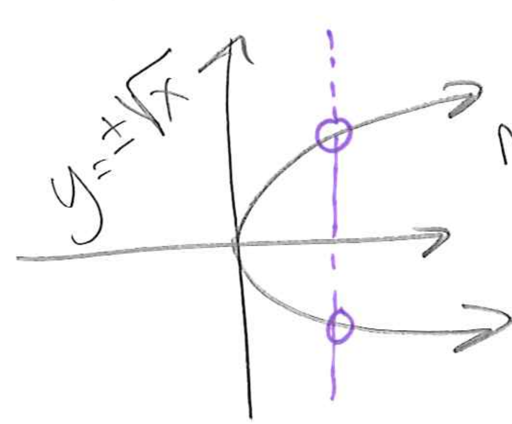
yes, fxn



yes, a fxn



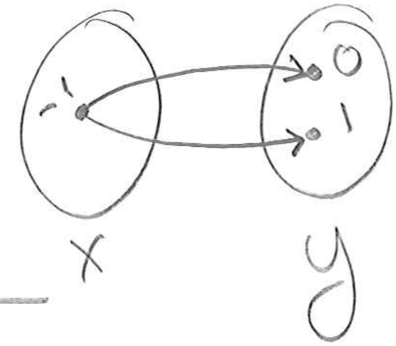
no, not a fxn



no, not a fxn

table

x	-1	2	-5	7	8	-1
y	0	3	-2	-7	0	1



not a fxn

x	-1	-4	-5	10	11	-1
y	0	7	8	12	9	0

yes, a fxn

Set a pnts

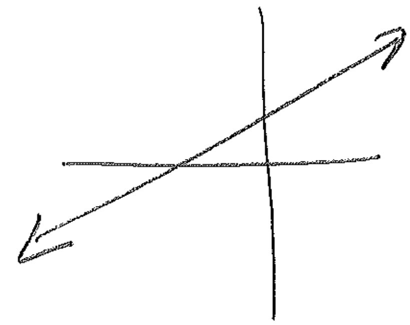
$S = \{(1,2), (3,4), (5,6)\}$ yes, fxn

$A = \{(1,2), (-3,-4), (1,6)\}$ no, not fxn

Is an equation a fxn?

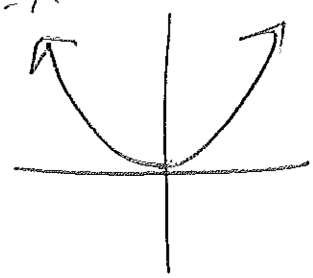
linear : $y = 2x + 1$ / $f(x) = 2x + 1$

"fxns"



Domain: $(-\infty, \infty)$

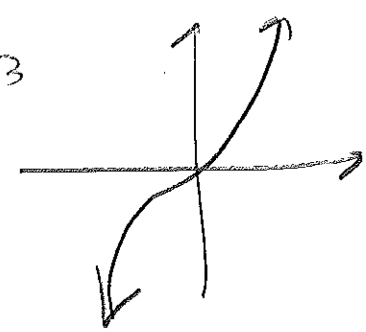
quadratic : $y = x^2$ / $f(x) = x^2$



"fxn"

Domain $(-\infty, \infty)$

cubic $y = x^3$ / $f(x) = x^3$

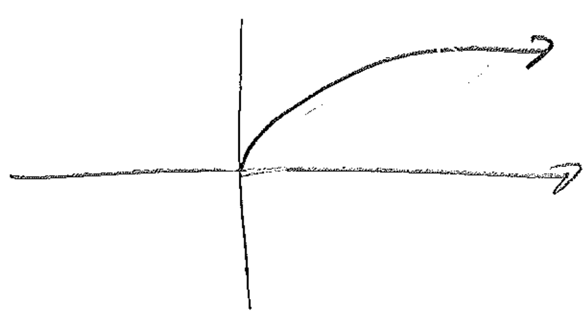


"fxn"

Domain $(-\infty, \infty)$

square root fxn $y = \sqrt{x}$, $f(x) = \sqrt{x}$

Domain: $[0, \infty)$



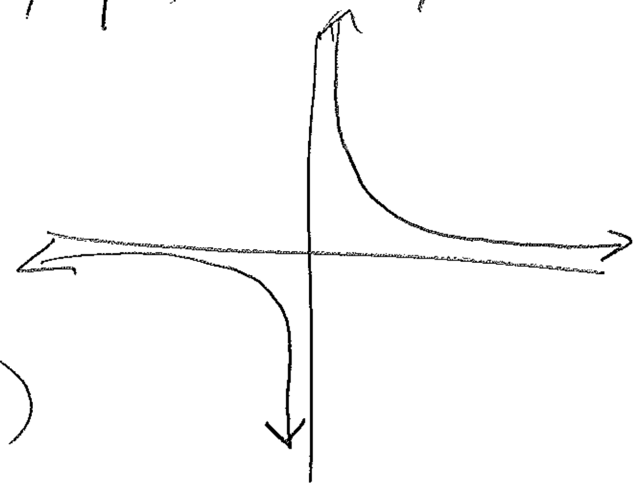
"fxn"

rational: $y = \frac{1}{x}$ / $f(x) = \frac{1}{x}$

"fxn"

Domain:

$(-\infty, 0), (0, \infty)$

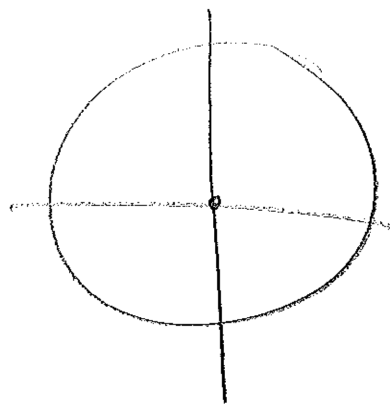


circle:

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

$-x^2 \qquad -x^2$

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



no fxn

$y = \pm\sqrt{r^2 - x^2}$ → two "y" values for each x value ∴ not a fxn

Evaluate fxns

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

- $f(3)$: substitute "3" in for "x"

$$f(3) = 2(3)^2 - 3(3)$$
$$= 2 \cdot 9 - 9$$
$$= 18 - 9$$
$$\underset{x}{f(3)} = \underset{y}{9} \Longrightarrow (3, 9)$$

- $3f(x)$: $3(2x^2 - 3x)$ vertical stretch

$$3f(x) = 6x^2 - 9x$$

- $f(x+3) = 2(x+3)^2 - 3(x+3)$ Horiz shift
- $f(x)+3 = (2x^2 - 3x) + 3$ vertical shift
- $f(-x) = 2(-x)^2 - 3(-x)$

$$= 2x^2 + 3x$$

reflection over y

Domain

$y = \sqrt{2x - 1}$

under radical cannot be negative so set ≥ 0

$$2x - 1 \geq 0$$
$$\underline{+1 \quad +1}$$
$$\frac{2x}{2} \geq \frac{1}{2}$$
$$x \geq \frac{1}{2}$$

Domain

$y = \dfrac{1}{x - 2}$

denominator cannot be zero so set $\neq 0$

$$x - 2 \neq 0$$
$$\underline{+2 \quad +2}$$
$$x \neq 2$$
$$\{x \in \mathbb{R} \mid x \neq 2\}$$
$$\boxed{(-\infty, 2), (2, \infty)}$$