Name: In-class notes
Tues 1/12/21

Class #:______

Math 48A, Lesson 1
Popular Classes of Function

✓

1. LINEAR FUNCTION	TYPE OF POWER FUNCTION

What do you remember about the equation for a line? Please talk with your group and come up with as much as possible

See next page...

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Class 3 Tuesday 1/12/2021

Lesson 1 : Popular classes of functions

Problem 1:

$$y = mx + b$$

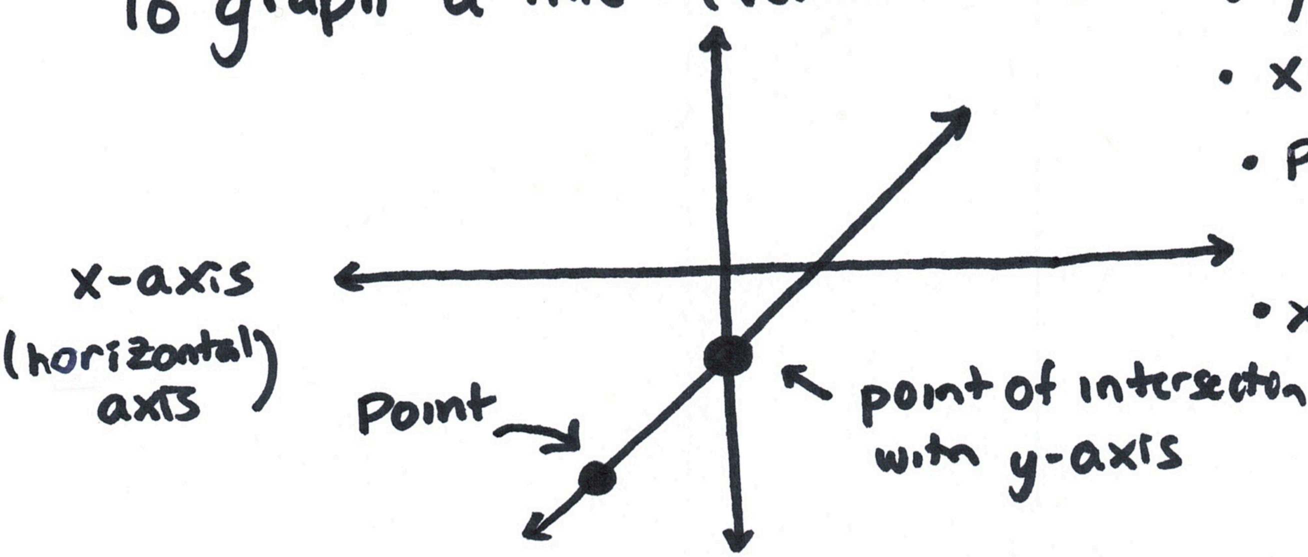
- Sonali
- Ryan

- m is $\boxed{\text{slope}}$
- b is the y $\boxed{\text{intercept}}$

this is called the slope-intercept form (Nerdy language)

To graph a line: y-axis (vertical axis)

- y-intercept
- x-intercept
- points on graph
- x-axis



- ☐ lines look "straight" ← (doesn't bend at all)
- ☐ a line is anything that starts a a point and connect with itself (
- ☐ Can a line bend? It doesn't have to be straight, does it?

curve ← one dimensional graph that can bend

(straight) line : a curve that does NOT bend at all

- ☐ slope is the rise over run

$$m = \frac{\text{rise}}{\text{run}}$$

- ☐ If we had graph paper, we could go up however many (rise) and then over (run)

- ☐ when the line cross paths with the y-axis that's called the y-intercept

- ☐ the y-axis is the vertical line in the "center of graph"

↓

☐ Street Knowledge 1

↓

☐ nerdy language

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INPUT GOAL: Learning

✓ 2. ABSOLUTE VALUE FUNCTIONS

☐ Start: 10:30am – 10:45am

How might we read the following statement:

$$f(x) = |x|$$

verbal: "f of x equals the absolute value of x"

What does this notation mean?

Notice: ☐ the vertical bars are known as absolute value symbols

☐ the notation $f(x)$ is called function notation

☐ $f(x) = |x|$ this represents the abs value function...

Let's study WTF absolute values do:

* Math Learning Trick:

To study a general math tool let's look at how that tool works using examples:

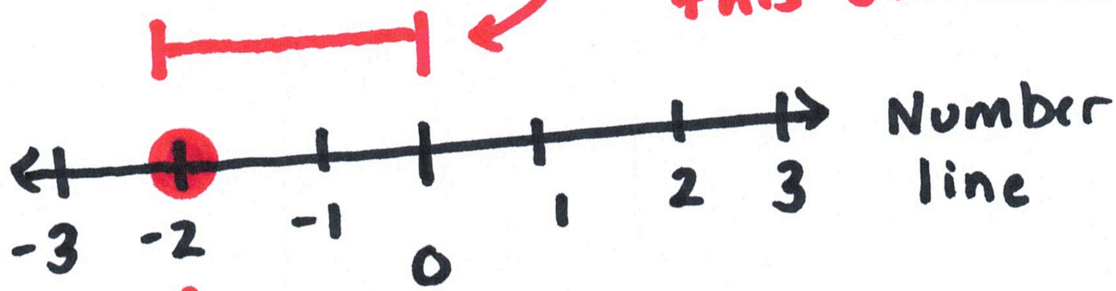
Eg 1: $x = -2 \Rightarrow |x| = |-2|$

$\Rightarrow |-2| = +2$

abuelita language : * when taking absolute values, we get rid of all the negative or positive symbols and the output is just the whole number

* absolute values track the distance from the input number to zero

Graphical image: $|-2| = 2$ measures this distance



here is input

$x = -2$

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3. QUADRATIC FUNCTIONS TYPE OF POWER FUNCTION

How might we read the following statement:

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

"f of x equals x squared"

What does this notation mean? See page 4 of this worksheet for some hints.

$$\underbrace{f(x) = x^2}$$

this is a power function with $n = 2$

- notice the power $n = 2 \in \mathbb{N}$
- 2 is a natural number
- 2 is a whole number that is positive

$$f(x) = x^2 = x \cdot x$$

times x by itself two times since power $n = 2$ -Jasiri

□ for $n=1$, we have power function

$$x^n = x^1 = x \ ?$$

■ identity function

- times x by itself one time since power $n=1$
- x stays by itself
- $1 \cdot x = x = x^1$

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4. How might we read the following statements? What does the notation mean? If possible, try to name the type of function using nerdy language. The first one is done for you 😁.

Statement	How to read?	What does it mean?
$f(x) = x^3$	"f of x equals x cubed" "f of x equals x to the third power" "f of x equals x to the power of three"	Multiply the input x by itself two times to get output. $f(x) = x^2 = x \cdot x$ My inner nerd 🤓 would call this a quadratic function.
$f(x) = x^4$	"f of x equals x to the 4th power" -Ciara	$f(x) = x^4$ - Bianca ‼️ $= x \cdot x \cdot x \cdot x$ x multiplied by itself four times since $n=4$
$f(x) = x^5$		

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5. POWER FUNCTIONS — NOT EXPONENTIAL FUNCTIONS, INVERSE OF ROOT FUNCTIONS

Let's explore power notation. How might we read the following statement:

$$f(x) = x^n \quad \text{for} \quad n \in \mathbb{N}$$

"f of x equals x to the power of n"

What does this notation mean? What are the special features of this notation?

- x^n — "x to the power of n"
- $n \in \mathbb{N}$
  - n is an element of the natural numbers
  - $\mathbb{N} = \{1, 2, 3, 4, \ldots\}$ (black board N)
  - $\mathbb{N}$ are not all numbers
  - $\mathbb{R}$ are all numbers (black board R)

$\mathbb{R}$ = all real numbers

(real numbers)

$\mathbb{N}$ = whole numbers that are positive

= anything positive number without a fraction (must be bigger than zero and zero not

- $\frac{1}{2} = 0.5$ is not a whole number

- Anything that is a $\boxed{\text{positive}}$ number ~~including zero~~ NOPE that doesn't have a fraction.

- Remember: - Zero is a whole number

- zero doesn't have extra change

$$0.0000\ldots$$

NO extra change

- zero is NOT positive

(positive means bigger than zero)

- zero is not negative

(negative means less than zero)

x^n for $n \in \mathbb{N}$

for $n \in \mathbb{N} = \{1, 2, 3, 4, \ldots\}$

for $n = 1$ or $n = 2$ or $n = 3$

or $n = 4$ or $n = 5$

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6.	SQUARE ROOT FUNCTION	TYPE OF ROOT FUNCTION INVERSE OF x^2

How might we read the following statement:

"f of x is the 2nd root of x"

$$f(x) = \sqrt[2]{x}$$

"f of x is equal to the square root of x" ~~to the power of two"~~ NOPE!

What does this notation mean? See page 7 of this worksheet for some hints.

☐ This notation is tricky because we don't have to write the two:

index n=2

$$f(x) = \sqrt[2]{x} = \sqrt{x}$$

We don't have to write the 2

- Sean

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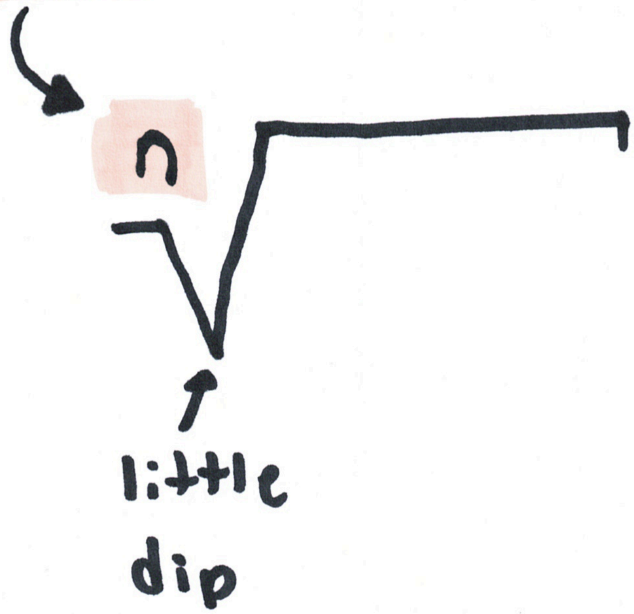
7. How might we read the following statements? What does the notation mean? If possible, try to name the type of function using nerdy language. The first one is done for you 😁.

Statement	How to read?	What does it mean?
$f(x) = \sqrt[3]{x}$	"f of x equals the cube root of x" "f of x equals the third root of x" "f of x equals x to the one third power"	Find a output y such that when we multiply that output by itself three times we get input x $y = \sqrt[3]{x} \iff y^3 = x$ My inner nerd 🤓 would call this a cube root function.
$f(x) = \sqrt[4]{x}$	"f of x equals the 4th root of x"	
$f(x) = \sqrt[5]{x}$		

- [ ] the index is above the little dip

-Vince



- [ ] the radicand is found/located inside/under the root symbol -Katrina

- [ ] the radicand is found inside the root symbol to the left of the down bar:

$$\sqrt[n]{x}$$

captured by down bar

- What's the reason we don't have to write the two - Jasiri

Anwer: • By math convention (agreement between nerd)

• square roots are really popular

General radical or root notation

Anatomy of a root

index

root symbol

$$f(x) = \sqrt[n]{\boxed{x}}$$

radicand (input to the root)

root symbols : $\sqrt{}$ ← down bar

table top (holds the index)

If $y = \sqrt[n]{x}$

then $y^n = x$.

Root function or

Radical function

Eg $y = \sqrt[2]{4}$

index n=2

root symbol

$= \sqrt[2]{4}$

radicand

$= 2$

Note : $\sqrt[\boxed{2}]{\boxed{4}} = 2$

if I multiply this by itself two

times I get
back to the
radicand

$$\Rightarrow \sqrt[2]{\boxed{4}} = 2 \Rightarrow \boxed{4} = 2^2$$
$$= 2 \cdot 2$$

Index $n = 2$

$$\text{Eg: } \sqrt[2]{9} = \boxed{3} \Rightarrow \boxed{9} = \boxed{3}^2$$

radicand

output
to the
root

"fourth root of 16"

$$\text{Eg: } \boxed{\sqrt[4]{16}} = \boxed{y} = 2$$

output

what number y do I have to multply by itself 4 times to get 16

$$\Rightarrow \boxed{16} = \boxed{y}^4 = y \cdot y \cdot y \cdot y$$