Midterm Notes

+ Order of Operations
  - GEMDAS
    - ① G, ② E, ③ MD (L→R), ④ AS (L→R)

+ Properties

+ Words ⟷ Numbers

Ex: Five less than the product of two and x.

→ $2x - 5$

Ex: $3(x+7)$

→ The product of three and x plus seven

+ Evaluate expression

$$3(m-2)+3z+5(m+z)$$

$$3m-6+3z+5m+5z$$

$3m+5m$ $\qquad$ $3z+5z$

$$\boxed{8m+8z-6}$$

Let $x=-8$ $\quad y=2$ $\quad z=\frac{1}{2}$

Evaluate $4y+z(x-y)$

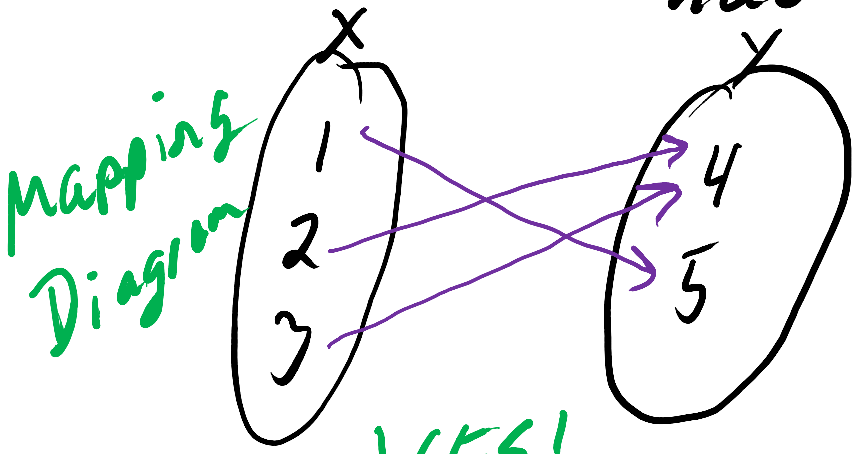
$4(2) + \frac{1}{2}(-8-2)$

$8 + \frac{1}{2}(-10)$

$8 - 5$

$\boxed{3}$

+ **Functions** - every input (x) only has one output (y)

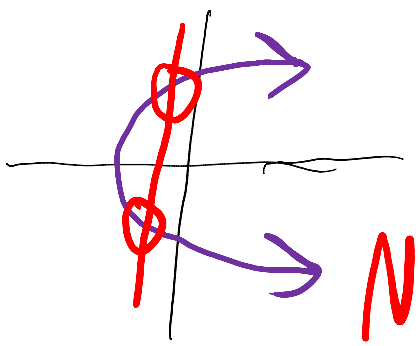


mapping Diagram

each x can only have one arrow

YES!

graph



NO!

Need to pass vertical Line Test

Table:

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

set:

$(1,5),(2,5),(3,5)$

YES!

No!

All different x values

+Function Notation

$$f(x) \longleftrightarrow y$$

Ex: $f(x) = 7x + 1$

Find $f(3)$, $f(-1)$, $f(2w)$

$$f(3) = 7(3) + 1 = 22$$

$$f(-1) = 7(-1) + 1 = -6$$

$$f(2w) = 7(2w) + 1 = 14w + 1$$

+ Drawing Graphs
  - increasing/decreasing
  - x and y intercepts

+ Solving Equations

Ex: $6\left(\frac{1}{3}x + 2\right) = \left(\frac{1}{6}x - 1\right)6$

$\frac{6}{3}x + 12 = \frac{6}{6}x - 6$

$2x + 12 = 1x - 6$

$-1x \quad -12 \quad -1x \quad -12$

$x = -18$

+ Absolute Value

- distance from zero

Ex: $|-10| = 10$

$|10| = 10$

- isolate value bars
- split into two equations
  (one positive, one negative)
- solve

Ex: $|x-2| = 10$

① $x - 2 = 10$
$+2 \quad +2$
$x = 12$

② $x - 2 = -10$
$+2 \quad +2$
$x = -8$

Ex: $2|x+1| - 4 = 12$
$+4 \quad +4$

$$\frac{2}{2}\boxed{|x+1|} = \frac{16}{2}$$

$$|x+1| = 8$$

$x+1=8$ or $x+1=-8$

$-1\ -1$ $\qquad$ $-1\ \ -1$

$\boxed{x=7}$ or $\boxed{x=-9}$

+ Literal Equations

Solve for y: $z \cdot \frac{xy-1}{z} = 2 \cdot z$

$xy-1=2z$

$+1 \qquad +1$

$$\frac{xy}{x} = \frac{2z+1}{x}$$

$$\boxed{y = \frac{2z+1}{x}}$$

+ Ratios + Proportions

Ex: $\frac{2}{3} = \frac{17}{x-38}$

$2(x-31) = 3(17)$

$2x - 76 = 51$

$+76 \quad +76$

$$\frac{2x}{2} = \frac{127}{2}$$

$$\boxed{x = 63.5}$$

+ Percent Change

Ex: original: $70.00

sale: 45.00

$$\%\text{ Change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100$$

$$= \frac{45 - 70}{} \times 100$$

70

$= \frac{-25}{70} =$ **35.7% decrease**

+ Dimensional Analysis

$\frac{350\ ft}{sec}$ to $\frac{miles}{hour}$

$$\frac{350\ ft}{1\ sec} \times \frac{1\ mile}{5280\ ft} \times \frac{60\ sec}{1\ min} \times \frac{60\ min}{1\ hr}$$

$$\frac{350 \cdot 1 \cdot 60 \cdot 60}{1 \cdot 5280 \cdot 1 \cdot 1} = \frac{1260000\ mi}{5280\ hr}$$

$= 238.636$ mph

+ Inequalities

Ex: Solve and Graph

when you multiply or divide by a negative you have to flip the sign

① $-3x + 1 < 10$

$-1 \quad -1$

$-3x < 9$

$-3 \qquad -3$

$x > -3$

$< \quad > \quad 0$

$\leq \quad \geq \quad \bullet$

$(-3, \infty)$

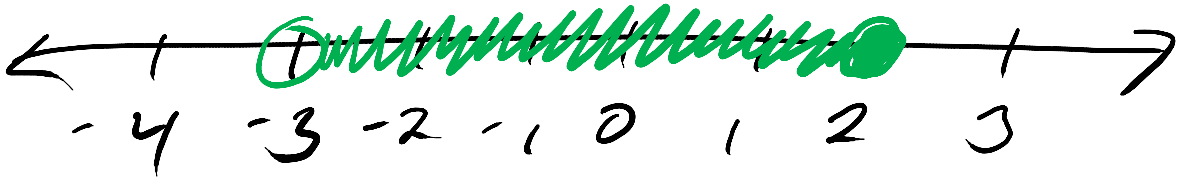
② $-7 < 2x - 1 \leq 3$

$+1 \qquad +1 \qquad +1$

$\frac{-6}{2} < \frac{2x}{2} \leq \frac{4}{2}$

$-3 < x \leq 2$

$x > -3$ AND $x \leq 2$



$(-3, 2]$

+ Rate of Change and Slope

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

+ X and Y-intercepts

ex: $3y - 4x = 12$

x-int: cover up $y \to -3$

y-int: cover up $x \to 4$

+ Vertical and Horizontal Lines

↓ slope is undefined

V.U.X.

x =

↓ slope = 0

HOY

y =

+ 3 Form

① Slope-Intercept

$y = mx + b$

↑ slope ↖ y-int

② Point-Slope

$$y - y_1 = m(x - x_1)$$

↑ point ↑ slope ↑ point

③ Standard

$$Ax + By = C$$

→ x can't be neg

→ variables ∧ same side

→ no common factors

→ No Fractions

+ Arithmetic Sequences

$$a_n = a_1 + (n-1)d$$

- a_n ↑ n^{th} term
- a_1 ↑ first term
- $(n-1)$ ↑ number of terms
- d ↑ common diffence

Ex: Write a formula for

$$7, \overset{+13}{} 20, \overset{+13}{} 33, \overset{+13}{} 46, \_\_, \_\_ \ldots$$

↑ a_1 $\quad d = 13$

$$a_n = 7 + (n-1)13$$

$$= 7 + 13n - 13$$

$$\boxed{a_n = 13n - 6}$$

Ex: Find the 72nd term

$n = 72$

$a_{72} = 13(72) - 6$

$\boxed{a_{72} = 930}$

+ Parallel Lines

↳ same slope

+ Perpendicular Lines

↳ opposite and reciprocal slopes

(one positive, one negative)

(flip-flopped)

Ex: $-\frac{2}{5}$ and $\frac{5}{2}$ | 3 and $-\frac{1}{3}$

Find line perpendicular to $y = -\frac{1}{2}x + 7$ and though $(6, -8)$

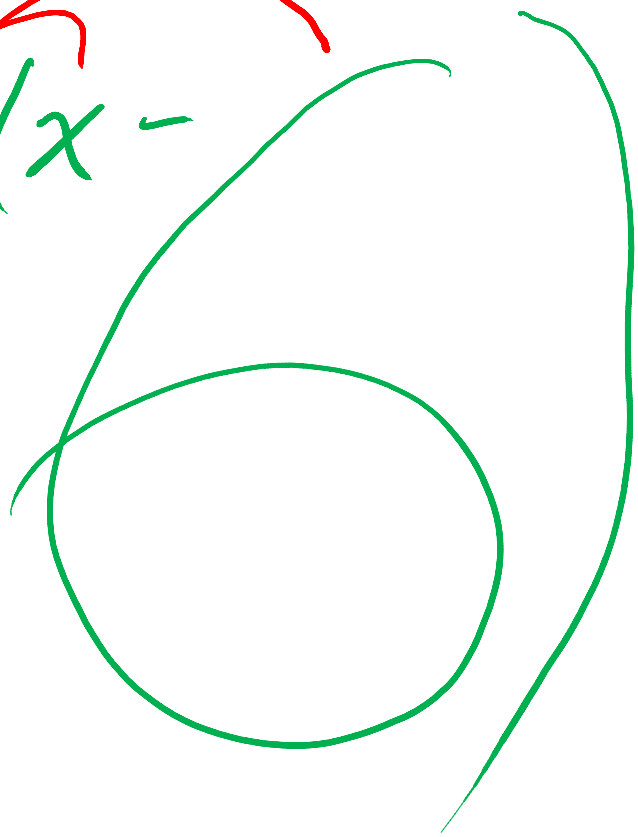
$m = 2$

$y_1 = -8$

$x_1 = 6$

$y - y_1 = m(x - x_1)$

$y + 8 = 2(x -$



$$y + 8 = 2x - 12$$

$$-8 \qquad -8$$

$$\boxed{y = 2x - 20}$$