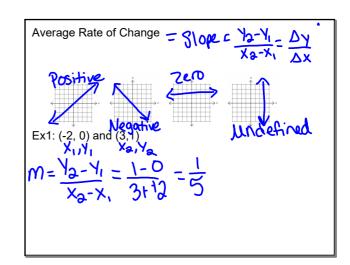## Unit 1- Functions and their Graphs   Lesson 1.1

Objective: SWBAT find the average rate of change and write linear functions including parallel and normal lines.

Kickoff

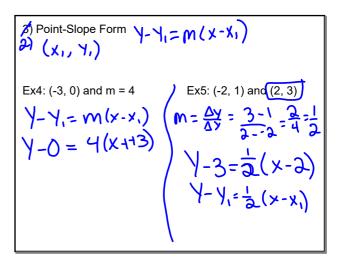What do you remember about linear functions? List as much as possible!

Constant slope
infinite
x-intercept → y=0

$y = mx + b$

Same $m = \parallel$ y-intercept $x=0$

Pos. (slope) Neg

Average Rate of Change $= \text{slope} = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{\Delta y}{\Delta x}$

Positive   Zero   Negative   Undefined

Ex1: (-2, 0) and (3,1)
      x_1, y_1 x_2, y_2

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{1 - 0}{3 + 2} = \dfrac{1}{5}$

Equations of Lines

1) Slope-Intercept Form $y = mx + b$ ← y-int.
                                  ↑ Average rate of change

only form to find m and b.

Ex2: m = -2 and (1,1)

$y = mx + b$ $\boxed{y = -2x + 3}$
$y = -2x + b$
$1 = -2(1) + b$
$1 = -2 + b$
$\underline{+2 \quad +2}$
$3 = b$

Ex3: (-2,-3) and (1,3)
     $x_1 y_1$ $x_2 y_2$

$m = \dfrac{\Delta y}{\Delta x} = \dfrac{3 + 3}{1 + 2} = \dfrac{6}{3} = 2$

$y = mx + b$
$y = 2x + b$
$3 = 2(1) + b$
$3 = 2 + b$
$1 = b$ $\boxed{y = 2x + 1}$

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2) Point-Slope Form $y - y_1 = m(x - x_1)$

2) (x_1, y_1)

Ex4: (-3, 0) and m = 4

$y - y_1 = m(x - x_1)$
$y - 0 = 4(x + 3)$

Ex5: (-2, 1) and (2, 3)

$m = \dfrac{\Delta y}{\Delta y} = \dfrac{3 - 1}{2 - -2} = \dfrac{2}{4} = \dfrac{1}{2}$

$y - 3 = \dfrac{1}{2}(x - 2)$
$y - y_1 = \dfrac{1}{2}(x - x_1)$

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4) General Form   **when a = 0 $By + C = 0$
3) $Ax + By + C = 0$ **when b = 0 $y = \#$
                         $Ax + C = 0$ vertical
                         $x = \#$ horizontal

Ex6: Change the following into general form.

$y + 1 = \dfrac{2}{3}(x - 2)$

$y + 1 = \dfrac{2}{3}x - \dfrac{4}{3}$

$-\dfrac{2}{3}x + \dfrac{4}{3} \quad -\dfrac{2}{3}x + \dfrac{4}{3}$

$-\dfrac{2}{3}x + y + \dfrac{7}{3} = 0$

Parallel and Normal Lines

Parallel Lines- never intersect
  ↳ * Same average rate of change
  * different b

Ex7: Find the slope intercept form of a line that passes through the point (2, -1) and is parallel to 2x - 3y = 5

$M = \dfrac{2}{3}$

$y = mx + b$
$y = \dfrac{2}{3}x + b$
$-1 = \dfrac{2}{3}(2) + b$
$-1 = \dfrac{4}{3} + b$
$\underline{-\dfrac{4}{3} \quad -\dfrac{4}{3}}$
$-\dfrac{7}{3} = b$

$-2x \quad -2x$
$-3y = -2x + 5$
$\dfrac{-3y}{-3} = \dfrac{-2x + 5}{-3}$
$y = \dfrac{2}{3}x - \dfrac{5}{3}$

$\boxed{y = \dfrac{2}{3}x - \dfrac{7}{3}}$

Normal Lines- perpendicular lines

↳ *slopes are negative reciprocals
       (change and flip)

↳ form right ∡'s

Ex8: Find the point slope form of a line that passes through the point (2, -1) and is ~~parallel~~ to 2x - 3y = 5

normal

$M = \frac{-3}{2}$

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

$y + 1 = \frac{-3}{2}(x - 2)$

$\frac{-2x \quad -2x}{}$

$\frac{-3y = -2x + 5}{}$

$\frac{-3}{-3}$

$y = \frac{2}{3}x - \frac{5}{3}$

Sum it up.

How do you find the average rate of change of a line and how do you use it to write equations of a line?