

DO NOW

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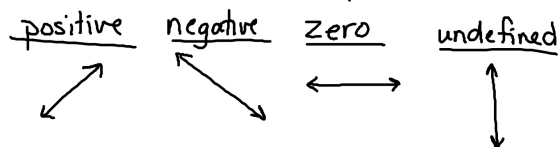
1.2 Linear Models and Rates of Change

Slope - of a the nonvertical line passing through (x_1, y_1) and (x_2, y_2) is:

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

$$x_1 \neq x_2$$

vertical line \rightarrow slope is undefined



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Equations of Lines

Standard form: $Ax + By = C$

General form: $Ax + By + C = 0$

Slope Intercept form: $y = mx + b$

Point Slope form: $y - y_1 = m(x - x_1)$

Intercept form: $\frac{x}{a} + \frac{y}{b} = 1$ $a \leftarrow x\text{-intercept}$
 $b \leftarrow y\text{-intercept}$

Vertical Line: $x = a$

Horizontal Line: $y = b$

Ex: Write an equation in general form for each of the following sets of given information.

1. point $(-2, 4)$ and $m = -\frac{3}{5}$ point-slope

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ 5[y - 4] &= -\frac{3}{5}(x + 2) \quad 5 \\ 5y - 20 &= -3(x + 2) \\ 5y - 20 &= -3x - 6 \\ 3x + 5y - 14 &= 0 \end{aligned}$$

2. x-intercept = 5 and y-intercept = -3 intercept form

$$\begin{aligned} \frac{x}{a} + \frac{y}{b} &= 1 \\ \left(\frac{x}{5} + \frac{y}{-3} = 1\right) 15 \\ 3x - 5y &= 15 \\ 3x - 5y - 15 &= 0 \end{aligned}$$

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3. points: $(-2, -5)$ and $(-1, -2)$

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ m &= \frac{-5 - (-2)}{-1 - (-2)} \\ m &= \frac{-3}{-1} = 3 \end{aligned}$$

slope

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

$$y - 5 = 3(x - 2)$$

$$y + 5 = 3x + 6$$

$$0 = 3x - y + 1$$

$$\text{or} \\ 3x - y + 1 = 0$$

point-slope

The slope of a line can be interpreted as a ratio or rate.

Ratio - If x & y axis have the same units of measure, the slope has no units and is a RATIO.

Rate - If x & y axis have different units of measure, the slope has units (of the form: per) and is a RATE.

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*See pg 14
Parallel lines -

parallel lines \longleftrightarrow if and only if equal slopes

Perpendicular lines -

perpendicular lines \longleftrightarrow negative reciprocal slopes

Ex: 4. Write the equation in general form of the line through the point $(-2, 1)$ and parallel to $2y - 6x = 9$

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 1 &= 3(x + 2) \\ y - 1 &= 3x + 6 \\ 0 &= 3x - y + 7 \\ \boxed{3x - y + 7} &= 0 \end{aligned}$$
$$\begin{aligned} 2y &= 6x + 9 \\ y &= 3x + \frac{9}{2} \\ \boxed{m=3} \end{aligned}$$

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5. Write an equation in general form of the line through the point $(-2, 1)$ and perpendicular to the line $2y - 6x = 9$

$$\begin{aligned} m &= 3 \\ \perp m &= -\frac{1}{3} \\ y - y_1 &= m(x - x_1) \\ y - 1 &= -\frac{1}{3}(x + 2) \\ 3y - 3 &= -(x + 2) \\ 3y - 3 &= -x - 2 \\ \boxed{x + 3y - 1} &= 0 \end{aligned}$$

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HOMEWORK

pg 16 - 17; 9, 11, 13, 23, 25, 26, 27,
31, 35, 45, 55, 59

*** Do not sketch the graph for 27, 31, 35

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