Objective 3 – Linear Functions

SLOPE AND INTERCEPT

slope, m: rate of change; as the absolute value of m increases, the line gets steeper

parallel lines: two lines that never touch; same distance apart; slopes are the same

perpendicular lines: two lines that cross to form a right angle; slopes are opposite reciprocals

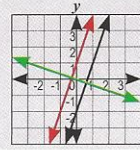
y-intercept, b: point at which the line crosses the y-axis; to find the y-intercept look at its graph or substitute $x = 0$ into the equation and solve for y; changing the y-intercept changes the initial condition of a problem

x-intercept: point at which the line crosses the x-axis; to find the x-intercept look at its graph or substitute $y = 0$ into the equation and solve for x

Example: Find the slope, m, of a line that passes through (-2, 5) and (1, -1).

$$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 5}{1 - -2} = \frac{-6}{3} = -2$$

Example: A line's slope is 3. A parallel line's slope is also 3. A perpendicular line's slope is $-\frac{1}{3}$.

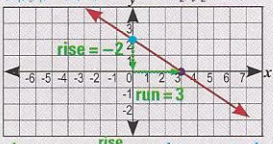


FORMS OF LINEAR EQUATIONS

linear function: function whose graph is a nonvertical line

Form	Linear Equation	
Slope-Intercept	$y = mx + b$	m is the slope and b is the y-intercept
Point-Slope	$y_2 - y_1 = m(x_2 - x_1)$	m is the slope
Standard	$Ax + By = C$	A, B, and C are integers; A is positive

y-intercept $(x_1, y_1) = (0, 2)$ **x-intercept** $(x_2, y_2) = (3, 0)$



slope = $m = \frac{\text{rise}}{\text{run}}$ **y-intercept = b**

$b = 2$

$$m = \frac{(y_2 - y_1)}{(x_2 - x_1)} = \frac{(0 - 2)}{(3 - 0)} = -\frac{2}{3}$$

slope-intercept form, $y = mx + b$

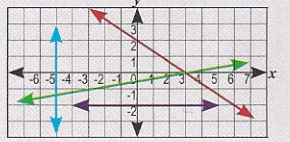
$y = -\frac{2}{3}x + 2$

negative slope, $-m$ diagonal line down and to the right

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

positive slope, $+m$ diagonal line up and to the right

$y = \frac{1}{6}x - \frac{1}{2}$



undefined slope vertical line

$x = -5$

zero slope, $m = 0$ horizontal line

$y = -2$

DIRECT VARIATION AND PROPORTIONAL CHANGE

direct variation: linear equation $y = kx$ where k = proportionality constant (slope)

Example: It takes Juan 30 minutes to read 60 pages. If pages read, p, is directly proportional to time, t, how many pages does Juan read in 120 minutes? **Answer: 240 pages**

1. Find k
   $p = kt$
   $60 = k(30)$
   $k = 2$
2. Given $k = 2$, find p at $t = 120$
   $p = 2t$
   $p = 2(120)$
   $p = 240$