A **linear function** is a function of the form $f(x) = mx + b$ or $y = mx + b$, where $m =$ **slope** $= \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$ and the point $(0, b)$ is the **y-intercept**, or the point where the graph of the function intersects the y-axis. The y-intercept of any function is found by plugging 0 in for x (evaluating $f(0)$).

$y = mx + b$ is called the **slope-intercept form** of the equation of a line.

$Ax + By = C$ is the **standard form** of the equation of a line.

A **horizontal line** has an equation of the form $y = b$, where b is the y-coordinate of every point on the line. A horizontal line has a slope of 0.

A **vertical line** has an equation of the form $x = a$, where a is the x-coordinate of every point on the line. A vertical line has no slope.

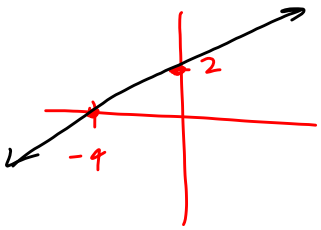
The **x-intercept**(s) of any function are the point(s) $(x, 0)$, found by substituting 0 in place of y in the equation (setting $f(x) = 0$) and solving for x.

3.3

23. $x - 2y = -4$

x-int: $(x, 0)$ $x - 2(0) = -4$, $x = -4$, $(-4, 0)$

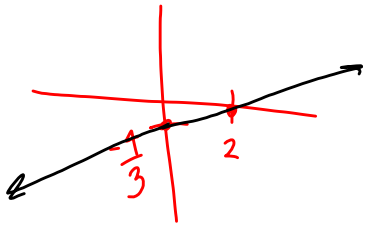
y-int: $(0, y)$ $0 - 2y = -4$, $-2y = -4$, $y = 2$, $(0, 2)$



32. $2x - 3y = 4$

x-int: $(2, 0)$

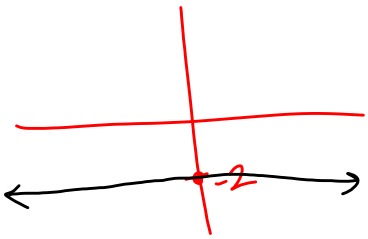
y-int: $(0, -\frac{4}{3})$



18. $y = -2$

x-int: none

y-int: $(0, -2)$



Sections 3-3-3.6 Linear Functions

Recall:

Slope-intercept equation:

$y = mx + b$

Standard Equation:

$Ax + By = C$

Point-slope formula:

$$\boxed{y - y_1 = m(x - x_1)}$$

Note that rearranged, this looks like:

$$m = \frac{y - y_1}{x - x_1}$$

Parallel & Perpendicular Lines:

Two lines with slopes m_1 and m_2 are **parallel** if and only if $m_1 = m_2$

*All vertical lines are parallel.

Two lines with slopes m_1 and m_2 are **perpendicular** if and only if $m_1 = \frac{-1}{m_2}$; $m_2 = \frac{-1}{m_1}$; $m_1 m_2 = -1$

*Vertical lines are perpendicular to horizontal lines

(negative reciprocal slopes)

Find the slope-intercept (y=mx+b) equation of the line:

1. slope $m = 2$; passing through (x_1, y_1) (3,7)

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

$y - 7 = 2(x - 3)$

$y - 7 = 2x - 6$

$y = 2x + 1$

2. passes through (-5, 2) & (6, -1)

$m = \frac{\Delta y}{\Delta x} = \frac{-1-2}{6-(-5)} = \frac{-3}{11} = -\frac{3}{11}$

$y - 2 = -\frac{3}{11}(x + (+5))$

$y - 2 = -\frac{3}{11}x - \frac{15}{11}$

$y = -\frac{3}{11}x - \frac{15}{11} + \frac{2}{1} \cdot \frac{11}{11}$

$y = -\frac{3}{11}x - \frac{15}{11} + \frac{22}{11}$

$y = -\frac{3}{11}x + \frac{7}{11}$

3. Given the line y=4x+3, find the equation of a line parallel to this that passes through (4, 1).

$m=4$

$y-1=4(x-4)$

$y-1=4x-16$

$y=4x-15$

4. Given the line y=-3x+7, find the equation of a line perpendicular to it that passes through (5,-8).

$m=\frac{1}{3}$

$y-(-8)=\frac{1}{3}(x-5)$

$y+8=\frac{1}{3}x-\frac{5}{3}$

$y=\frac{1}{3}x-\frac{5}{3}-\frac{24}{3}$

$y=\frac{1}{3}x-\frac{29}{3}$

Find the equation of the line:

5. Passes through (-7, 6) ; no slope

$x=-7$

6. Passes through (43, -269) ; slope 0

$y=-269$

Are the two lines parallel, perpendicular, or neither?

3.6

4. $y=\frac{1}{2}$; $y=-4$

parallel (both horizontal, slope 0)

10. $y=\frac{1}{2}x+\frac{3}{2}$; $y=-\frac{1}{2}x+\frac{3}{2}$

neither one!

14. $4x-3y=2$; $4x+3y=-7$

$-3y=-4x+2$ $\quad 3y=-4x-7$

$y=\frac{4}{3}x-\frac{2}{3}$ $\quad y=-\frac{4}{3}x-\frac{7}{3}$

neither!

20. (3,5)&(−3,3) ; (2,−5)&(−4,4)

$m_1=\frac{3-5}{-3-3}$ $\quad m_2=\frac{4-(-5)}{-4-2}$

$=\frac{-2}{-6}$ $\quad =\frac{9}{-6}$

$=\frac{1}{3}$ $\quad =-\frac{3}{2}$

neither!

Quiz **Tomorrow** (Wednesday) on:

- midpoint
- distance
- slope
- equation of a line
- functions
- domain
- range

Wednesday and Friday we will look at solving systems of equations.