

Section 1.6 Lines

The slope of a line joining (x_1, y_1) and (x_2, y_2)

is $m = \frac{y_2 - y_1}{x_2 - x_1}$

If $x_1 = x_2$, the slope is undefined and the line is vertical.

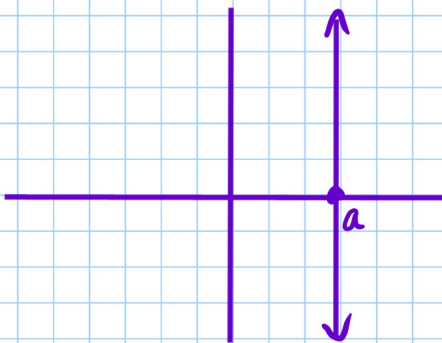
If $y_1 = y_2$, the slope is 0 and the line is horizontal

ex: $(1, 2)$ and $(5, -3)$

$$m = \frac{-3 - 2}{5 - 1} = -\frac{5}{4}$$

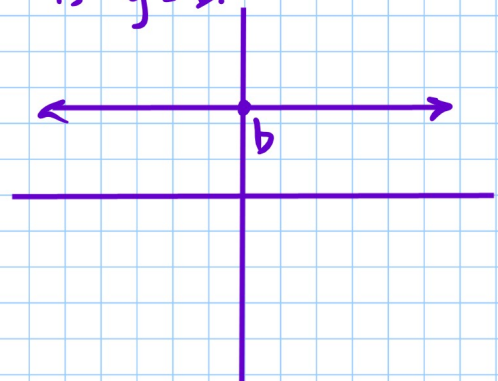
Vertical Lines

through $(a, 0)$, the equation is $x = a$



Horizontal Lines - through

$(0, b)$, the equation is $y = b$.



Slope-Intercept Form $y = mx + b$ where $m = \text{slope}$
and b is the y -intercept

General Form $Ax + By = C$ where $A, B,$ and C
are integers and A and B are not both
zero.

ex: Find the equation of the line through $(5, -4)$ with $m = 10$. Find both slope-intercept and general.

$$y = 10x + b$$

$$-4 = 10 \cdot 5 + b$$

$$-4 = 50 + b$$

$$-54 = b$$

$$\text{slope-intercept: } y = 10x - 54$$

$$0 = 10x - y - 54$$

$$54 = 10x - y$$

$$\text{General: } 10x - y = 54$$

ex: Find eq. in slope-intercept and general for the line joining $(-3, 4)$ and $(2, -5)$.

$$m = \frac{-5 - 4}{2 - (-3)} = -\frac{9}{5}$$

$$y = -\frac{9}{5}x + b$$

$$-5 + -\frac{9}{5} \cdot 2 \triangleright \text{FRAC}$$

$$-5 = -\frac{9}{5}(2) + b$$

$$-5 = -\frac{18}{5} + b$$

$$-\frac{25}{5} + \frac{18}{5} = -\frac{7}{5} = b$$

$$\text{Slope-Intercept: } y = -\frac{9}{5}x - \frac{7}{5}$$

$$5 \left(\frac{9}{5}x + y = -\frac{7}{5} \right)$$

$$\text{General: } 9x + 5y = -7$$

Two lines are parallel if they have the same slope.

Two lines are perpendicular if their slopes are opposite reciprocals.

ex: Find an equation of the line that contains (1, -2) and is \perp to the line $x + 3y = 6$

$$3y = -x + 6$$

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

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

So slope of \perp is 3

$$-2 = 3 \cdot 1 + b$$

$$-5 = b$$

$$y = 3x - 5$$

p72-73 35-57 odd, 89, 91