

## 2.3 Lines

What is the equation for slope of a line?

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

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

The Equation for a vertical line is  $x = a$   
where  $a =$  x intercept

If  $y_1 = y_2$  then the slope is zero  
and the line is horizontal

The Equation for a horizontal line is  $y = b$   
where  $b =$  y intercept

### Point-Slope Form

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

When do we use the point-slope form?

when we have a point & a slope  
or two points

How do you find a slope given two points?

plug them into the point-slope formula

Ex  $(-1, 4)$  &  $(3, -1)$

$$4 - (-1) = m(-1 - 3)$$

$$\frac{5}{-4} = m$$

how plug it back in along w/one of the given points

$$y - 4 = -\frac{5}{4}(x + 1)$$

$$y - 4 = -\frac{5}{4}x - \frac{5}{4} + 4$$

$$y = -\frac{5}{4}x - \frac{5}{4} + \frac{4 \cdot 4}{1 \cdot 4}$$

$$y = -\frac{5}{4}x + \frac{11}{4}$$

### Slope-Intercept Form

$$y = mx + b$$

slope  $\uparrow$   $y$  intercept  $\uparrow$

When do we use the slope-intercept form?

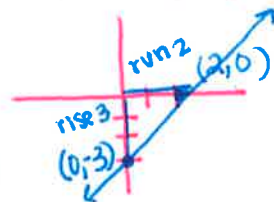
any time you have or need to find the slope or intercept or graph

Ex

$$3x - 2y = 6 - 3x$$

$$-2y = -3x + 6$$

$$y = \frac{3}{2}x - 3 \quad \text{so } m = \frac{3}{2} \quad b = -3$$



### General Form

$$ax + by = c$$

When do we use the general form?

to graph by finding x & y intercepts

Ex

$$3x + 2y = 6$$

let  $x=0$  to find y intercept

$$3(0) + 2y = 6$$

$$\frac{2y}{2} = \frac{6}{2} \quad y = 3 \quad \boxed{(0, 3)}$$

let  $y=0$  to find x intercepts

$$3x + 2(0) = 6$$

$$\frac{3x}{3} = \frac{6}{3} \quad x = 2 \quad \boxed{(2, 0)}$$

Parallel lines: two nonvertical lines are parallel if and only if their slopes are the same and they have different y intercept

Ex  $3x - 4y = 12$  & goes through the pt  $(-1, 3)$

$$-4y = -3x + 12$$

$$\frac{-4y}{-4} = \frac{-3x}{-4} + \frac{12}{-4}$$

$$y = \frac{3}{4}x - 3$$

so  $m = 3/4$

now plug back in to pt slope

$$y - 3 = \frac{3}{4}(x - (-1))$$

$$y - 3 = \frac{3}{4}x + \frac{3}{4} + \frac{3 \cdot 4}{4}$$

$$y = \frac{3}{4}x + \frac{15}{4}$$

Perpendicular lines: two nonvertical lines are

perpendicular if and only if their slopes are opposite reciprocals of each other and the product of their slopes is -1

Ex perpendicular to  $3x - 4y = 12$  & contains  $(-1, 3)$

we know slope is  $m = \frac{3}{4}$  so opposite reciprocal of  $m$  would be  $-\frac{4}{3}$  so plug in pt-slope form

$$y - 3 = -\frac{4}{3}(x + 1)$$

$$y = -\frac{4}{3}x - \frac{4}{3} + \frac{3 \cdot 3}{3}$$

$$y = -\frac{4}{3}x + \frac{5}{3}$$