

# Point-Slope Form

Linear Equations in  
Two Variables

# What we Know so far....



Slope Intercept Form

$$y = mx + b$$

Where ***m*** is the slope and ***b***  
is the intercept

# What is Slope?

Steepness

+ SLOPE +

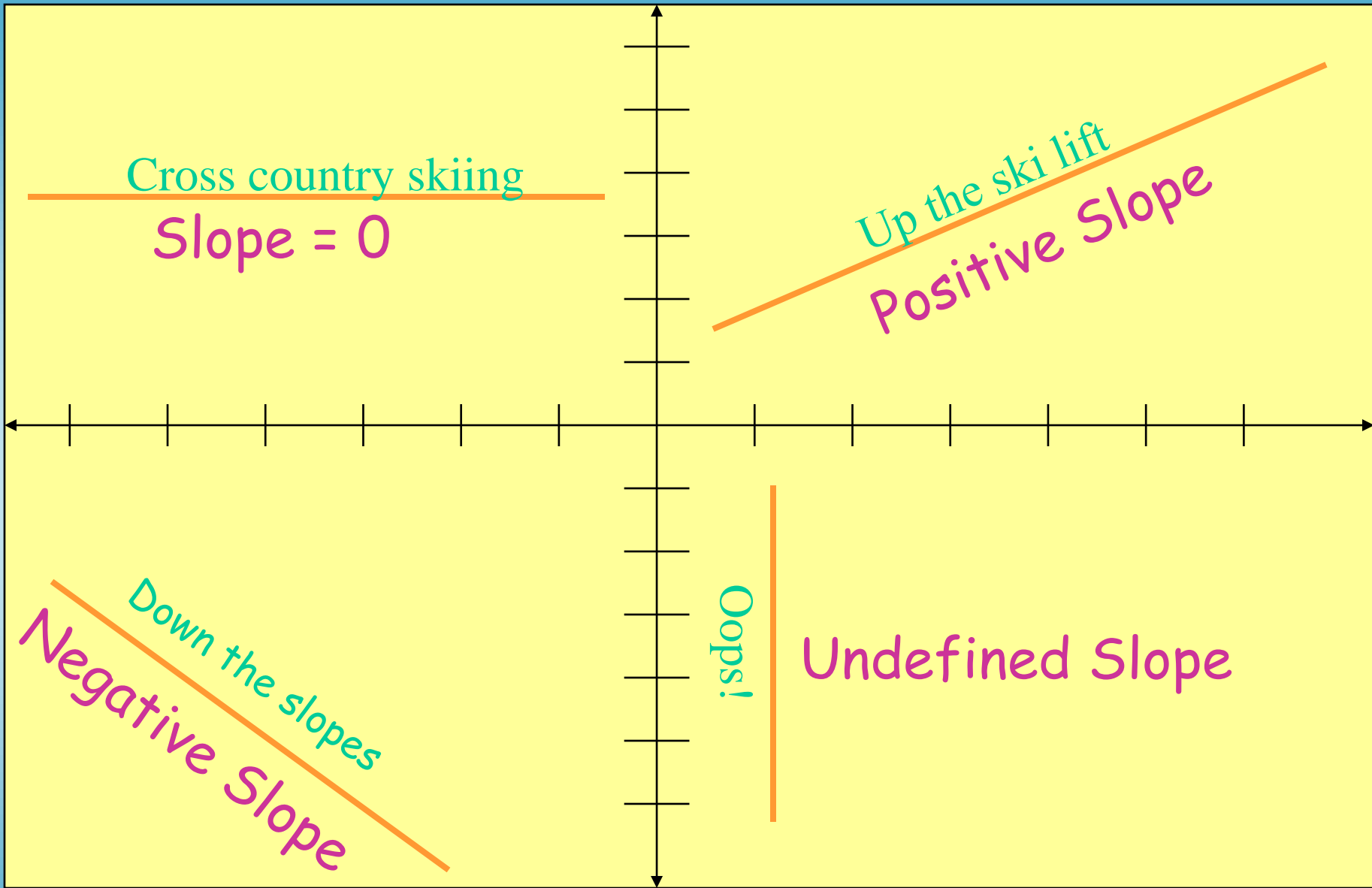
Rise  
Run

$$y = mx + b$$

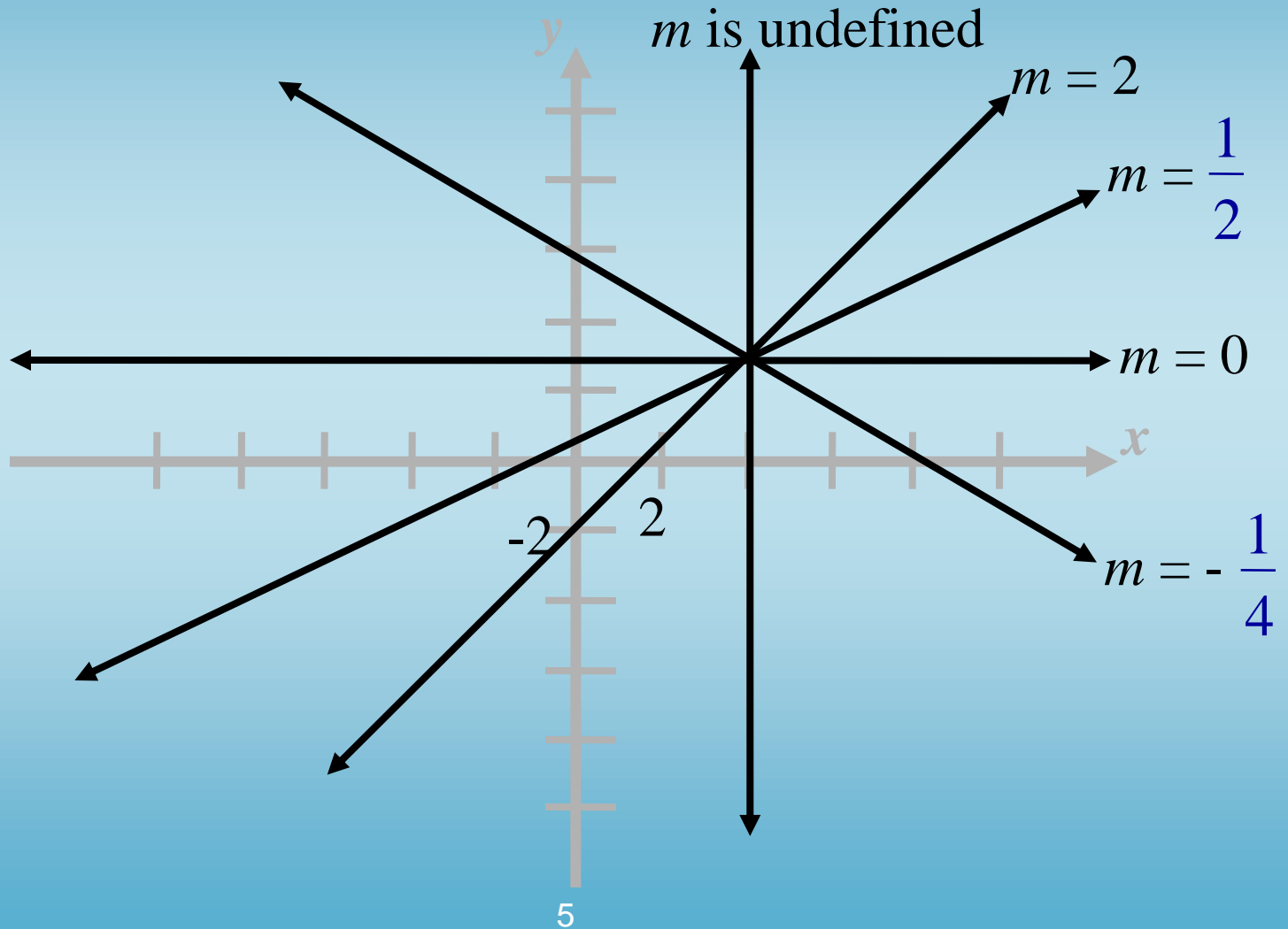
Amount of Slant

- SLOPE -

$\frac{\text{Change in } y}{\text{Change in } x}$



The **slope** of a line is a number,  $m$ , which measures its steepness.



# The New Stuff... Point- Slope Form



Point- Slope form is:

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

Where  $m$  is the slope  
and  $(x_1, y_1)$  is the  
given point

# Write the Equation in Point-Slope Form

$$m = -\frac{1}{3} \text{ and } (-1, -6)$$

Step 1: Plug it in

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

$$y + 6 = -\frac{1}{3}(x + 1) \quad \textit{Point-Slope Form}$$

$$\frac{1}{3} + x \frac{1}{3} = y + 6$$

$$y = -\frac{1}{3}x - 5\frac{2}{3} \quad \textit{Slope - Intercept Form}$$

A linear equation written in the form

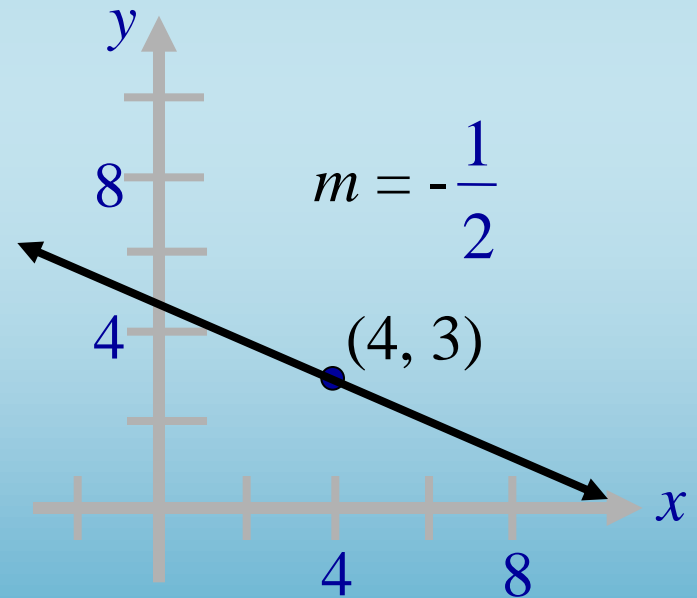
$y - y_1 = m(x - x_1)$  is in **point-slope form**.

*The graph of this equation is a line with slope  $m$  passing through the point  $(x_1, y_1)$ .*

Plot the point, then rise & run from there....

**Example:**

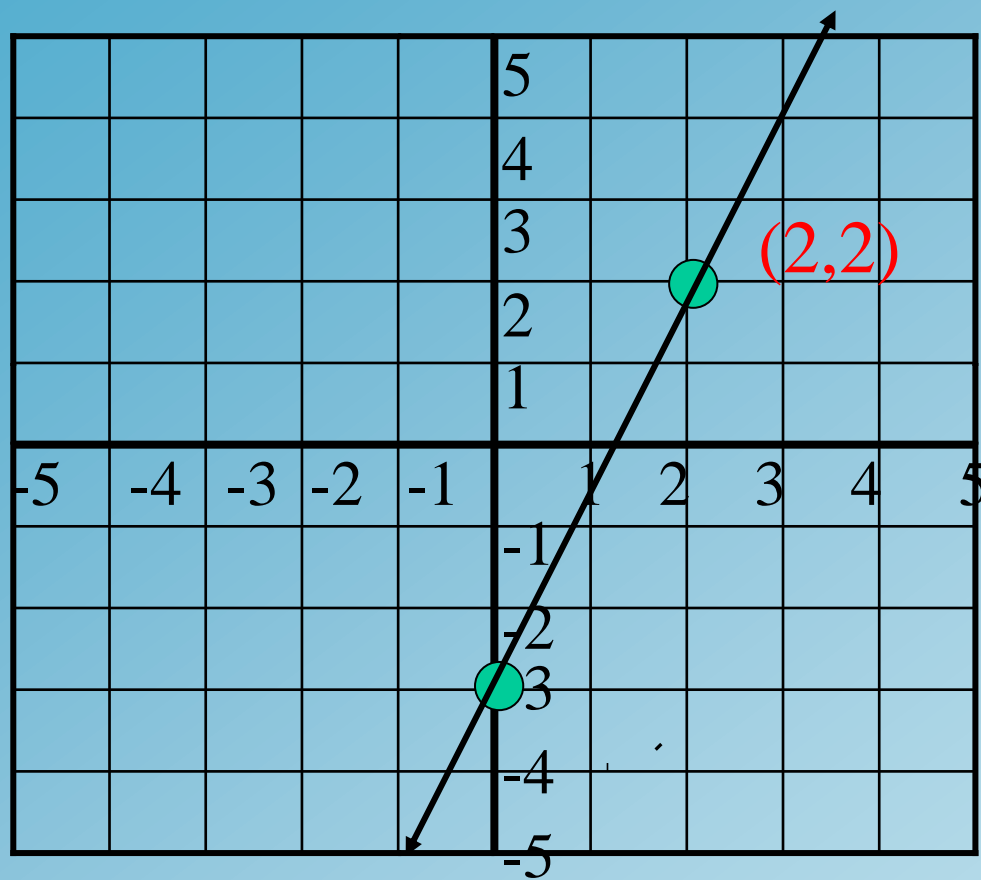
The graph of the equation  
 $y - 3 = -\frac{1}{2}(x - 4)$  is a line  
of slope  $m = -\frac{1}{2}$  passing  
through the point  $(4, 3)$ .





# Using Point-Slope Form

We need the slope and a point:  $m = \frac{5}{2}$  and  $(2,2)$



Plug them into the  
point-slope form

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

*Point - Slope Form*

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

**Example:** Write the point-slope form for the equation of the line through the point  $(-2, 5)$  with a slope of 3.

Use the point-slope form,  $y - y_1 = m(x - x_1)$ , with  $m = 3$  and  $(x_1, y_1) = (-2, 5)$ .

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

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

Let  $m = 3$ , let  $(x_1, y_1) = (-2, 5)$ .

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

Simplify into point-slope form

# Given two points, write the equation of a line in point-slope form

**(2,-3) and (4,-2)**

Steps:

1. Find slope

$$\frac{-2 - (-3)}{4 - 2} = \frac{-2 + 3}{2} = \frac{1}{2}$$

2. Place a point and the slope in into point slope form

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

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

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

3. Point-Slope form

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



Solve for y  
& get ..

Slope-intercept form

$$y = \frac{1}{2}x - 4$$

# To write point-slope into slope-intercept:

Simplify using distributive property, then move the constant to the right side & combine like terms

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

$$y - 2 = \frac{5}{2}x - 5$$

$$y = \frac{5}{2}x - 5 + 2$$

$$y = \frac{5}{2}x - 3$$

**Or** move the constant to the right side, then distribute & combine like terms

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

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

$$y = \frac{5}{2}x - 5 + 2$$

$$y = \frac{5}{2}x - 3$$

**Example:** Write the slope-intercept form for the equation of the line through the points (4, 3) and (-2, 5).

$$m = \frac{5 - 3}{-2 - 4} = -\frac{2}{6} = -\frac{1}{3}$$

Calculate the slope.

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

Point-slope form

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

Use  $m = -\frac{1}{3}$  and the point (4, 3).

*Solve for y...*

$$y = -\frac{1}{3}x + \frac{13}{3}$$

Slope-intercept form



# A Challenge



Can you write the equation of a line in point-slope form that passes through  $(-3, 6)$  and  $(1, -2)$

$$m = \frac{6 + 2}{-3 - 1} = -\frac{8}{4} = -\frac{2}{1}$$

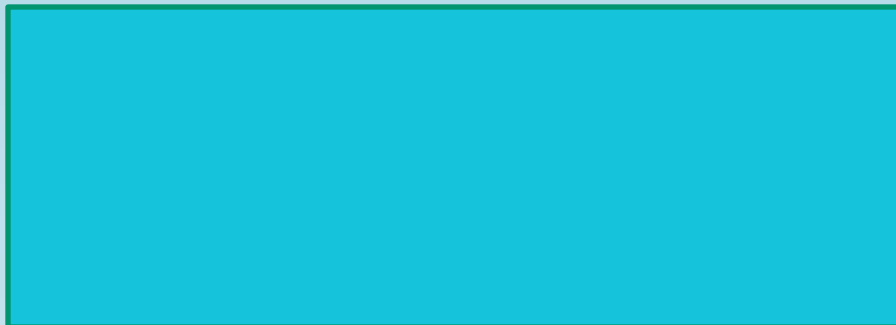
Calculate the slope.

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

Use  $m = -2$  and the point  $(1, -2)$ .

$$y + 2 = -2(x - 1)$$

**Point-Slope Form**



Slope-Intercept Form

# Applications

1. Raymond ordered rose bushes for his back yard. They cost \$15 each. The shipping cost was \$10. If his bill was \$85, how many rose bushes did he order?
  - What are the variables (what letters will you use)?
  - Write the equation using the variables.
  - Solve the equation and answer the question

1. Raymond ordered rose bushes for his back yard. They cost \$15 each. The shipping cost was \$10. If his bill was \$85, how many rose bushes did he order?

– **VARIABLES:**  $r$  (rose bushes) and  $s$  (shipping)

– **EQUATION:**  $15r + s = 85$

– **SOLVE:**  $15r + 10 = 85$

$$15r = 75$$

$$r = 5$$

***Raymond ordered 5 rose bushes***



2. The length of a rectangle is 6 inches longer than its width. The perimeter is 36 inches. What are the length and width?

- What are the variables (what letters will you use)?
- Write the equation using the variables.
- Solve the equation and answer the question

2. The length of a rectangle is 6 inches longer than its width. The perimeter is 36 inches. What are the length and width?

– **VARIABLES:** L (length) and W (width)

– **EQUATION:**  $L + W + L + W = 36$

and  $L = 6 + W$

– **SOLVE:**  $(6 + W) + W + (6 + W) + W = 36$

$$12 + 4W = 36$$

$$4W = 24$$

$$W = 6$$

***The length is 12 and the width is 6***