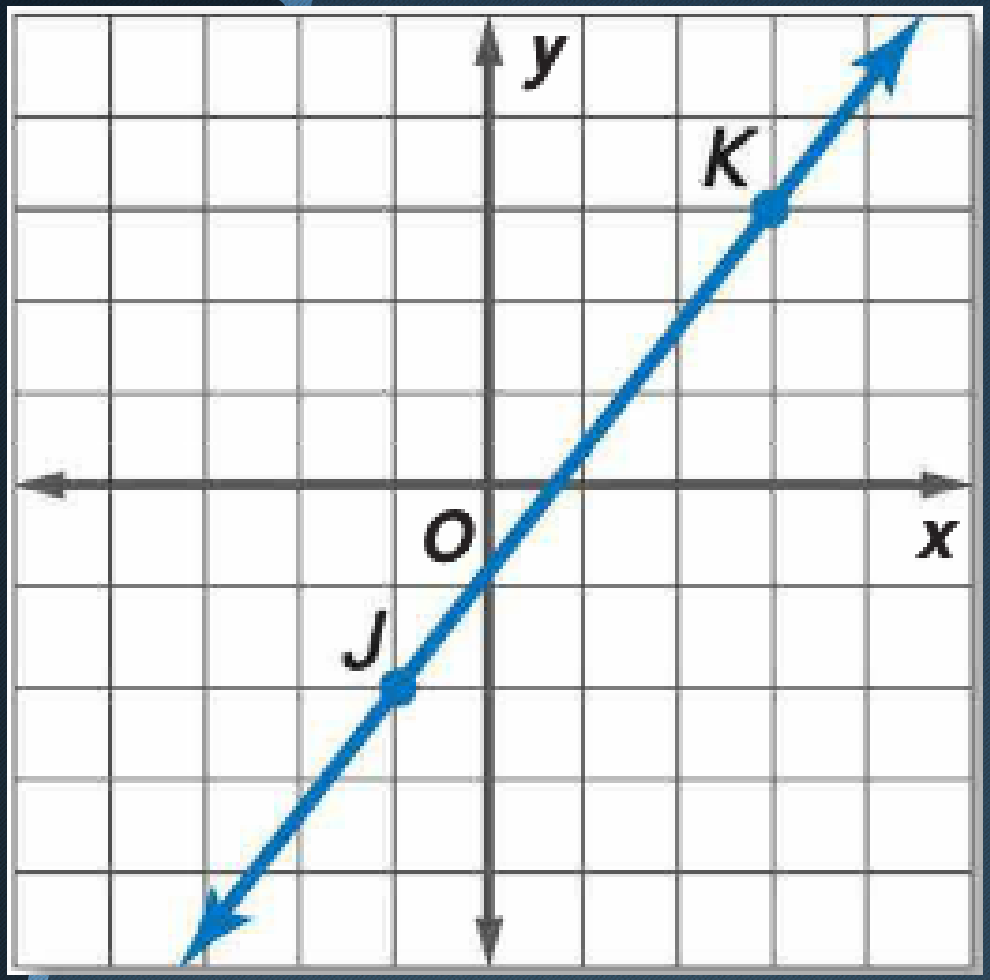
Slopes and Equations of Lines

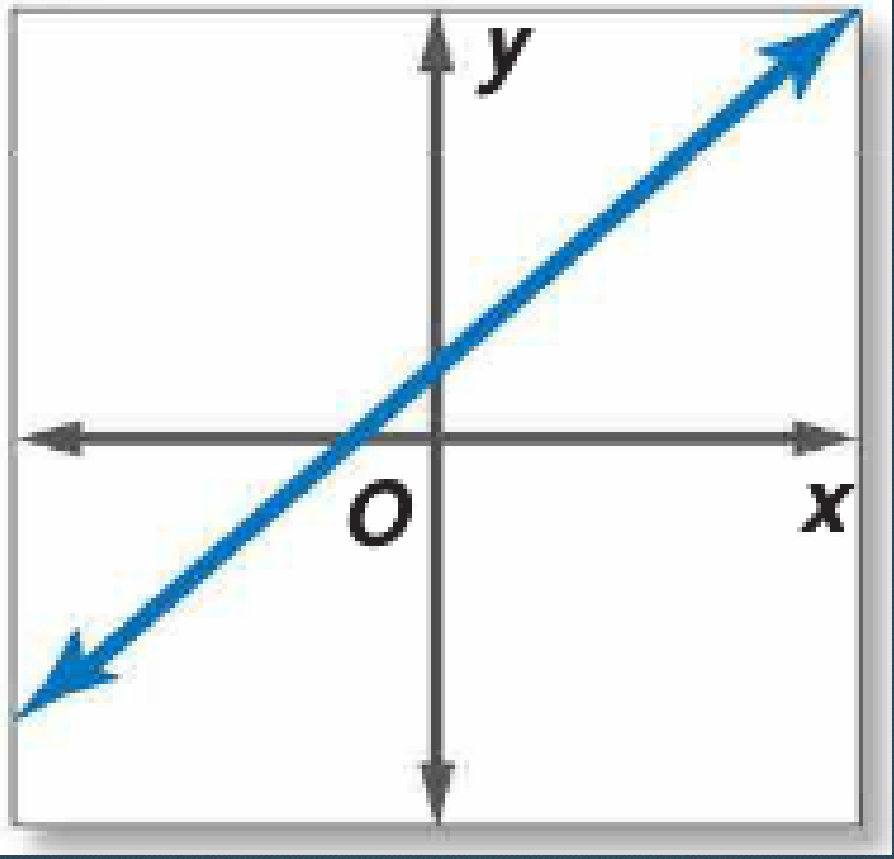
Slope

- "The ratio of the change along the y-axis to the change along the x-axis between any two points on the line.
- "Rate of change
- "Change in y over change in x

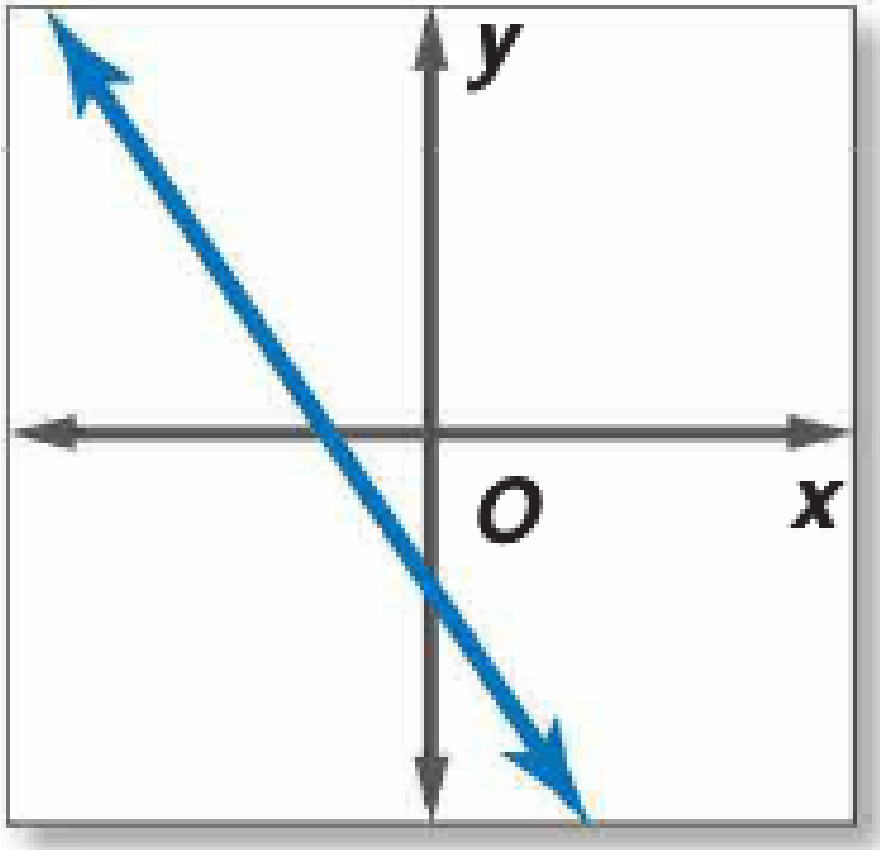
$$m = \frac{\text{change in } y}{\text{change in } x} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$


y
K
O
x
J

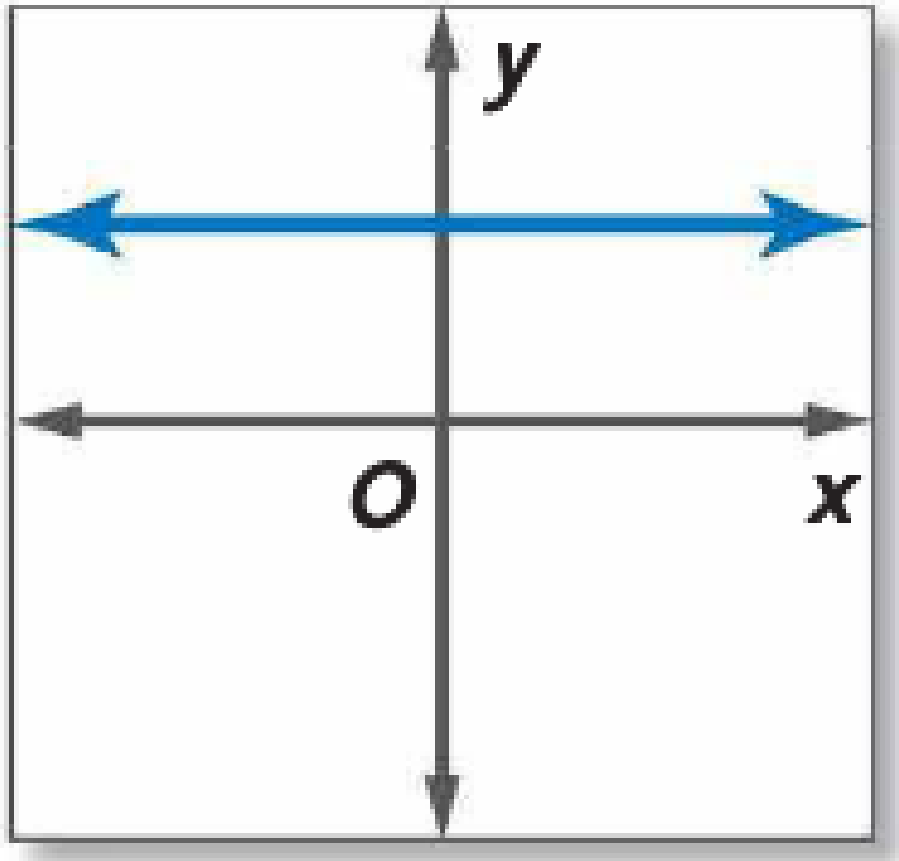
Positive Slope



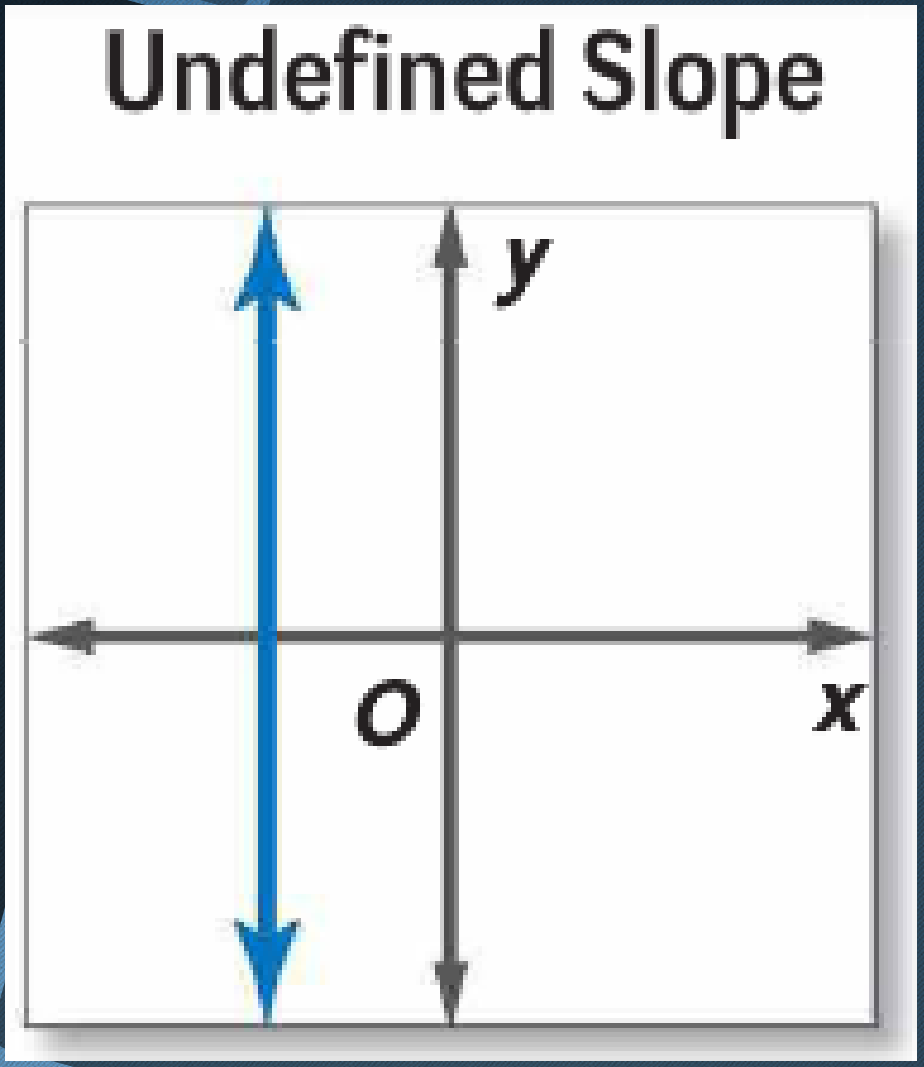
Negative Slope



Zero Slope



Undefined Slope



Slopes of Parallel Lines

"Two nonvertical lines have the same slope if and only if they are parallel. All vertical lines are parallel

Slopes of Perpendicular Lines

"Two nonvertical lines are perpendicular if and only if the product of their slopes is -1. Vertical and horizontal lines are perpendicular.

Examples

- Determine whether lines AB and CD are *parallel, perpendicular, or neither.*

- A(14, 13), B(-11,0), C(-3,7), D(-4-5)

Examples

- Determine whether lines AB and CD are *parallel, perpendicular, or neither.*
  - A(14, 13), B(-11,0), C(-3,7), D(-4-5)
  - $m_{AB} = 13/25; m_{CD} = 12/1$
  - neither

Examples

- Determine whether lines AB and CD are *parallel, perpendicular, or neither.*

- A(3, 6), B(-9,2), C(5,4), D(2,3)

Examples

- Determine whether lines AB and CD are *parallel, perpendicular, or neither.*
- A(3, 6), B(-9,2), C(5,4), D(2,3)
- $m_{AB} = 4/12 = 1/3$; $m_{CD} = 1/3$
- Same slope→parallel

Equations of Lines

- Slope-intercept form: $y=mx+b$; m is slope, b is y-intercept
- Point-slope form: $y-y1=m(x-x1)$; m is slope

Examples

- Slope and Y-intercept:
- Write an equation in slope-intercept form of the line with slope 4 and y-intercept of -7.

Examples

- Slope and Y-intercept:
- Write an equation in slope-intercept form of the line with slope 4 and y-intercept of -7.
- $y = 4x - 7$

Examples

- Slope and a Point on the Line
- Write an equation in point-slope form of the line with slope -2/3 and passes through the point (4,-2).

Examples

- Slope and a Point on the Line

- Write an equation in point-slope form of the line with slope -2/3 and passes through the point (4,-2).

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

Examples

- Two Points
- Write an equation in slope-intercept form of the line through points (2,5) and (-7,-9).

Examples

- Two Points
- Write an equation in slope-intercept form of the line through points (2,5) and (-7,-9).
  - m = 14/9; b = 17/9
  - y = 14x/9 + 17/9

Horizontal and Vertical Lines

- The equation of a horizontal line is $y=b$, where b is the y-intercept of the line.
  - $y=3$

- The equation of a vertical line is $x=a$, where a is the x-intercept of the line.
  - $x=-4$

Examples

- "Write an equation in slope-intercept form for a line perpendicular to $y=-2x+6$ containing (3,2).

Examples

- Write an equation in slope-intercept form for a line perpendicular to $y=-2x+6$ containing (3,2).

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

Examples

- "Write an equation in slope-intercept form for a line parallel to $y = 4x - 5$ containing (-1,5).

Examples

- Write an equation in slope-intercept form for a line parallel to $y = 4x - 5$ containing (-1,5).

- $m = 4$
- $y = 4x + 9$