

# Point-Slope Form of a Line

MATH 101 *College Algebra*

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# Objectives

- Graph a line given its slope and the coordinates of a point on the line.
- Find the equation of a line given its slope and the coordinates of a point on the line.
- Find the equation of a line given the coordinates of two points on the line.

# Background

We have discussed two forms of the equation of a line.

Standard Form  $Ax + By = C$

Slope-Intercept Form  $y = mx + b$

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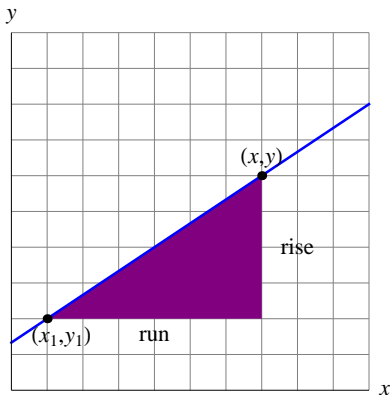
**Standard Form**  $Ax + By = C$

**Slope-Intercept Form**  $y = mx + b$

Recall the slope  $m = \frac{\text{rise}}{\text{run}}$

# Graphing a Line

Given the coordinates of a point on a line, say  $(x_1, y_1)$ , and the slope of the line  $m = \frac{\text{rise}}{\text{run}}$ , another point on the line would be **rise** units vertically from  $(x_1, y_1)$  and **run** units horizontally from the point.



# Point-Slope Form

Given the **coordinates**  $(x_1, y_1)$  of any point on a line and the **slope**  $m$  of the line, then any other point  $(x, y)$  will satisfy the slope formula:

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

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This formula can be written as

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

which is called the **point-slope form** of the equation of a line.

# Two Points

If  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points on the same line, then we can find the equation of the line in two steps:

- 1 Find the slope  $m = \frac{y_2 - y_1}{x_2 - x_1}$ .
- 2 Use the slope  $m$  and one of the points in the point-slope formula  $y - y_1 = m(x - x_1)$ .



# Parallel and Perpendicular Lines

Parallel and perpendicular lines are related through their slopes.

- **Parallel lines** never intersect and have **equal** slopes.
- **Perpendicular lines** intersect at  $90^\circ$  angles and whose slopes are **negative reciprocals** of each other.