

Section 2.3: Lines

Key Topics: slope of a line, equation of a line, parallel and perpendicular lines

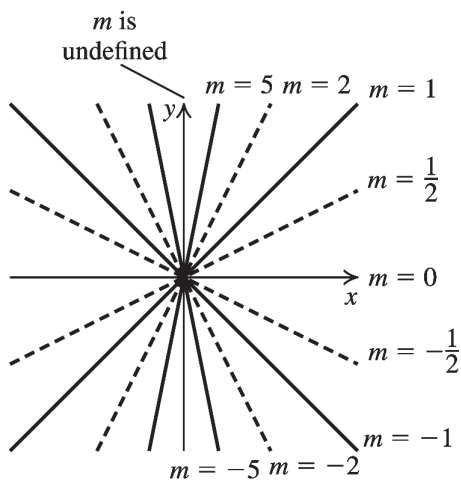
Slope of a Line

The **slope** of a nonvertical line that passes through the points $P(x_1, y_1)$ and $Q(x_2, y_2)$ is denoted by m and is defined by

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}, \quad \text{provided } x_2 \neq x_1$$

The slope of a vertical line is undefined.

Find the slope of the line containing the points $(4, -1)$ and $(0, 7)$.



The Point-Slope Form of the Equation of a Line _____

If a line has slope m and passes through the point (x_1, y_1) , then the _____
of an equation of the line is

_____.

Find the point slope-form of equation of the line passing through the point $(-3, 7)$ and with the slope $m = 2$. Then solve for y .

Slope-Intercept Form of the Equation of a Line _____

The _____ of the equation of the line with slope m and y -intercept
 b is

_____.

Graph the line whose equation is $y = \frac{3}{2}x + 4$ in the xy -plane.

HORIZONTAL AND VERTICAL LINES

An equation of a horizontal line through (h, k) is _____.

An equation of a vertical line through (h, k) is _____.

General Form of the Equation of a Line

The graph of every linear equation

_____ ,

where a , b , and c are constants and a and b are not both zero, is a line. The equation $ax + by + c = 0$ is called the **general form** of the equation of a line.

Sketch the graph of $5x - 3y - 15 = 0$.

Parallel and Perpendicular Lines

Let ℓ_1 and ℓ_2 be two distinct lines with slopes m_1 and m_2 , respectively. Then

ℓ_1 is parallel to ℓ_2 if and only if _____.

ℓ_1 is perpendicular to ℓ_2 if and only if _____.

Any two vertical lines are parallel, as are any two horizontal lines. Any horizontal line is perpendicular to any vertical line.