

WRITE THE EQUATION OF A LINE

Formulas

Slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope-intercept form: $y = mx + b$

Point-slope form $y - y_1 = m(x - x_1)$

1. Given: Slope (m) and the y-intercept (0, b)
Use: Slope-intercept form: $y = mx + b$

Example: Write the equation of a line with a slope of 5 and a y-intercept of (0, -7).
Since $m = 5$ and (0, -7) is the y-intercept, $b = -7$, then substituting into the form $y = mx + b$ will give us the equation of the line: $y = 5x - 7$

2. Given: Slope (m) and point (x_1, y_1)
Use: Point-slope form: $y - y_1 = m(x - x_1)$

Example: Write the equation of a line in slope-intercept form, with a slope of -3 and goes through the point (3, -2).
Since $m = -3$ and (3, -2) is the point (x_1, y_1) , substitute into the form
 $y - y_1 = m(x - x_1)$.
 $y - (-2) = -3(x - 3)$
 $y + 2 = -3x + 9$
 $y = -3x + 7$

3. Given: Two points (x_1, y_1) and (x_2, y_2)
Use: a. $m = \frac{y_2 - y_1}{x_2 - x_1}$
b. Pick one of the two points and use point-slope form

Example: Write the equation of a line in slope-intercept form that goes through the two points (-1, 4) and (2, -2).
a. $m = \frac{-2 - 4}{2 - (-1)} = \frac{-6}{3} = -2$ b. $m = -2$, using point (-1, 4)
 $y - 4 = -2(x - (-1))$
 $y - 4 = -2(x + 1)$
 $y - 4 = -2x - 2$
 $y = -2x + 2$

4. Given: An equation of a line with a parallel or perpendicular relationship and a point (x_1, y_1) .
Use: The given equation of a line and the relationship to find the slope. (Parallel use the same slope, perpendicular use the opposite-reciprocal slope). Then use point-slope form.

Example: Write the equation of a line in slope-intercept form that is perpendicular to $2x - 3y = 6$ and goes through the point (-1, 2).
a. Solve the given equation for y to identify the slope.
 $2x - 3y = 6$
 $-3y = -2x + 6$
 $y = \frac{2}{3}x - 2, \quad m = \frac{2}{3}$
b. Use $m = \frac{-3}{2}$ because it is the perpendicular slope to $2x - 3y = 6$, and point (-1, 2).
 $y - 2 = \frac{-3}{2}(x + 1)$
 $y - 2 = \frac{-3}{2}x - \frac{3}{2}$
 $y = -\frac{3}{2}x + \frac{1}{2}$