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Section 3.5

Equations of lines

need: Point & slope

Point Slope form

Setup forms

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

or $m = \frac{y - y_1}{x - x_1}$ (fractions)

answer forms

Slope - intercept form

$$y = mx + b$$

(Solve for y)

Standard form

$$ax + by = c$$

get all the x's & y's on the same side

$$a > 0 (x)$$

a ≠ fraction

Example 1

Write the equation of the line through $(-3, 5)$ that is perpendicular to the line $3x + 5y = 15$. Write your answer in both standard & slope - intercept form.

Need: point: $(-3, 5)$ to
Slope: $3x + 5y = 15$

$$5y = -3x + 15$$

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

⊥ to $-\frac{3}{5}$

$$= \frac{5}{3}$$

Sep 24, 2012

traditional

Slope - intercept $(y = mx + b)$

(3, 5) $y - y_1 = m(x - x_1)$

$m = \frac{5}{3}$ $y - 5 = \frac{5}{3}(x + 3)$

$y - 5 = \frac{5}{3}x + \frac{5}{3} \cdot \frac{3}{1}$

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

$y = \frac{5}{3}x + 10$

traditional Standard form $ax + by = c$

$y - 5 = \frac{5}{3}(x + 3)$

$3(y - 5) = \frac{5}{3}(x + 3)$

$3y - 15 = 5x + 15$

$-5x + 3y = 15 + 15$

$-5x + 3y = 30$

$5x - 3y = -30$

We can live the - side

a rule for standard form.

Sep 24, 2012

Proportion

slope - intercept
 $y = mx + b$

$$(-3, 5) \quad m = \frac{y - y_1}{x - x_1}$$
$$m = \frac{5}{3}$$

with proportion
we can cross multiply

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

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

$$3y - 15 = 5x + 15$$

+15 +15

$$3y = 5x + 30$$

$$y = \frac{5}{3}x + 10$$

Proportion

Standard $ax + by = c$

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

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

$$5x + 15 = 3y - 15$$

$$5x - 3y = -15 - 15$$

$$5x - 3y = -30$$