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MATH 101

Fall 2022

HW 15: Due 11/09

“It is hard to convince a high-school student that he will encounter a lot of problems more difficult than those of algebra and geometry.”

—E.W. Howe

Problem 1. (10pt) Find the equation of the line passing through the point $(-1, 8)$ and perpendicular to the x -axis.

Solution. Because the line is perpendicular to the x -axis (which is horizontal), the line must be vertical. But then the line must be of the form $x = c$ for some c . Because the line contains the point $(-1, 8)$, it must be that $x = -1$.

Problem 2. (10pt) Find the equation of the line through $(-5, 4)$ that is perpendicular to the line $y = 5 - 3x$.

Solution. Because the line is perpendicular to the line $y = 5 - 3x$, the line must have the form $y = mx + b$. The line is perpendicular to $y = 5 - 3x$, which has slope -3 . The line must then have slope $m = -\left(\frac{1}{-3}\right) = \frac{1}{3}$. Because the line contains the point $(-5, 4)$, it must be that $x = -5$ and $y = 4$ satisfy the equation $y = mx + b$. But then...

$$y = mx + b$$

$$y = \frac{1}{3}x + b$$

$$4 = \frac{1}{3} \cdot -5 + b$$

$$4 = \frac{-5}{3} + b$$

$$b = 4 + \frac{5}{3}$$

$$b = \frac{12}{3} + \frac{5}{3}$$

$$b = \frac{17}{3}$$

Therefore, the line is $y = \frac{1}{3}x + \frac{17}{3}$.