INSTRUCTOR GUIDANCE EXAMPLE: Week Three Discussion

Parallel and Perpendicular

For this week's discussion I am going to find the equations of lines that are parallel or perpendicular to the given lines and which are passing through the specified point. First, I will work on the equation for the parallel line.

The equation I am given is	$y = -\frac{2}{3}x + 2$
The parallel line must pass through point	$(-6, -3)$

I have learned that a line parallel to another line has the same **slope** as the other line, so now I know that the slope of my parallel line will be $-\frac{2}{3}$. Since I now have both the **slope** and an **ordered pair** on the line, I am going to use the point-slope form of a linear equation to write my new equation.

$y - y_1 = m(x - x_1)$	This is the general form of the point-slope equation
$y - (-3) = -\frac{2}{3}[x - (-6)]$	I plugged in my given slope and ordered pair
$y + 3 = -\frac{2}{3}(x + 6)$	I evaluated any signs next to each other
$y + 3 = -\frac{2}{3}x - \frac{2}{3}(6)$	I distributed the $-\frac{2}{3}$ to each term inside the parentheses
$y + 3 = -\frac{2}{3}x - 4$	I show here the distribution of the $-\frac{2}{3}$ and multiplied $-\frac{2}{3}$ times 6, which is –4
$y = -\frac{2}{3}x - 4 - 3$	I subtracted 3 from both sides, moving like-terms together so I can combine them
$y = -\frac{2}{3}x - 7$	Like-terms are combined, and the result is the equation of my parallel line!

This line falls as you go from left to right across the graph of it, the **y-intercept** is 7 units below the **origin**, and the **x-intercept** is 10.5 units to the left of the **origin**.

Now I will write the equation of the perpendicular line.
The equation I am given is $y = -4x - 1$
The perpendicular line must pass through point $(0,5)$

I have learned that a line perpendicular to another line has a **slope** which is the negative **reciprocal** of the **slope** of the other line. So the first thing I must do is find the negative **reciprocal** of –4.

The reciprocal of –4 is $-\frac{1}{4}$, and the negative of that is $-\left(-\frac{1}{4}\right) = \frac{1}{4}$. Now I know my slope is $\frac{1}{4}$ and my given point is $(0,5)$. Again, I will use the point-slope form of a linear equation to write my new equation.

$y - y_1 = m(x - x_1)$	This is the general form of the point-slope equation
$y - 5 = \frac{1}{4}(x - 0)$	I plugged in my given slope and ordered pair
$y - 5 = \frac{1}{4}x - \frac{1}{4}(0)$	I distributed the $\frac{1}{4}$
$y - 5 = \frac{1}{4}x$	I multiplied $-\frac{1}{4}(0)$
$y = \frac{1}{4}x + 5$	I add 5 to both sides of the equation, and the result is the equation of my perpendicular line!

This line rises as you move from left to right across the graph. The y-intercept is five units above the original and the x-intercept is 20 units to the left of the origin.

[The answers to part d of the discussion will vary with students' understanding.]