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 $y = -\tfrac{2}{3} x + 2$
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 $-\tfrac{2}{3}$. 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
$y - (-3) = -\tfrac{2}{3}[x - (-6)]$	Substituting in my known **slope** and **ordered pair**
$y + 3 = -\tfrac{2}{3}x + (-\tfrac{2}{3})6$	Simplifying double negatives and distributing the **slope**
$y = -\tfrac{2}{3}x - 4 - 3$	Because $(-\tfrac{2}{3})6 = -4$ and 3 is subtracted from both sides
$y = -\tfrac{2}{3}x - 7$	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 am ready to 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 $-\tfrac{1}{4}$, and the negative of that is $-(-\tfrac{1}{4}) = \tfrac{1}{4}$. Now I know my slope is ¼ and my given point is (0, 5). Again I will use the point-slope form of a linear equation to write my new equation.

$y - y_1 = m(x - x_1)$	
$y - 5 = \tfrac{1}{4} (x - 0)$	Substituting in the **slope** and **ordered pair**
$y - 5 = \tfrac{1}{4} x$	The zero term disappears
$y = \tfrac{1}{4} x + 5$	Adding 5 to both sides of the equation
	The equation of my perpendicular line!

This line rises gently as you move from left to right across the graph. The **y-intercept** is five units above the **origin** 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.]