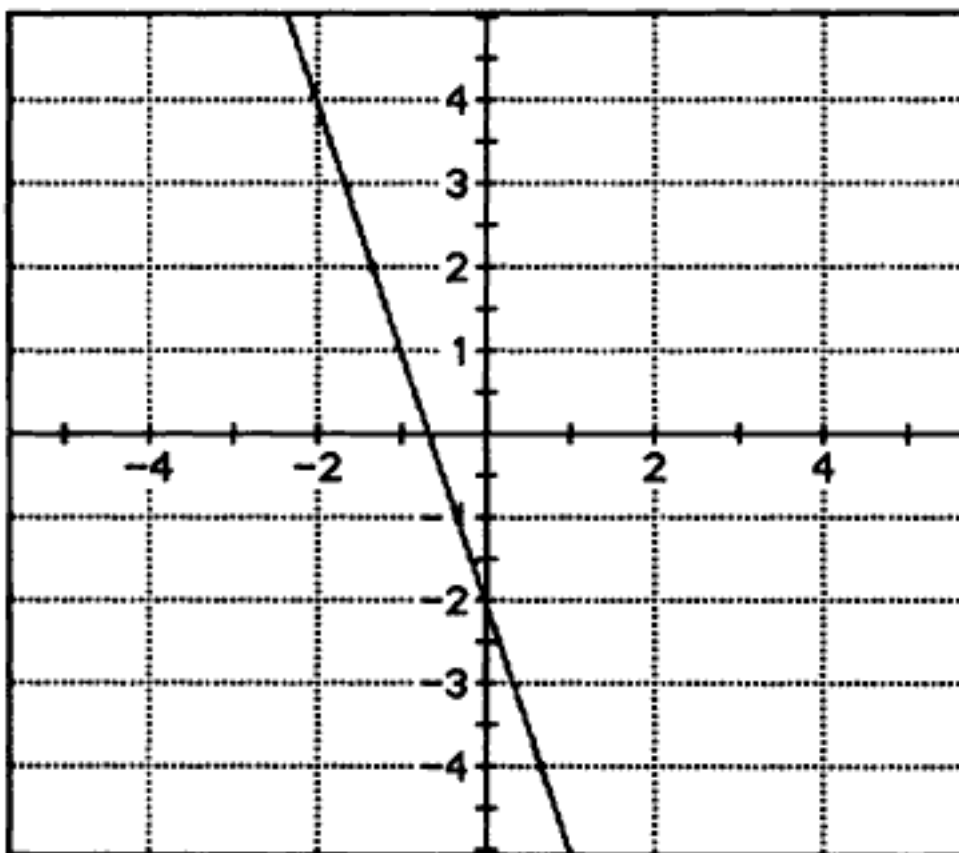


136 Homework #2

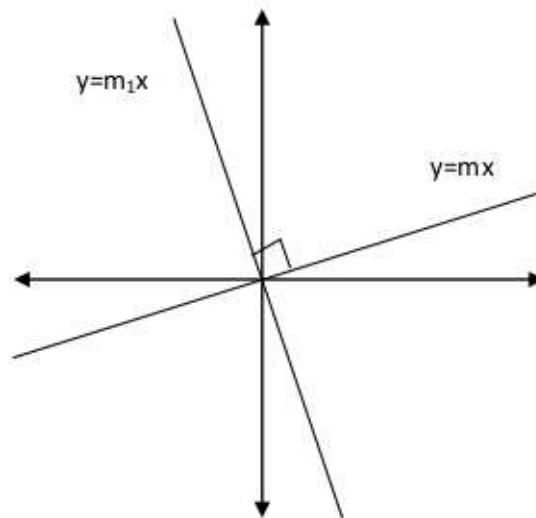
Due: **Thursday, 10/1**

This homework is in addition to the regularly assigned 171 weekly homework. Feel free to use your notes or book, and you also may work together so long as you write up your solutions on your own.

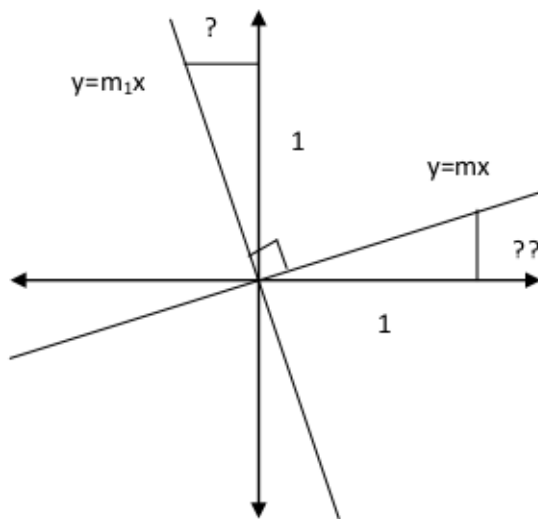
1. The graph below represents the equation $ax + 3y = -6$.
 - (a) Without solving for a , find a solution to the equation.
 - (b) Do as little algebra as possible to find the equation represented by the graph (which comes down to just finding the value of a). For example, you shouldn't have to calculate the slope or change the form of the equation of the line. (Hint: See part 1a.)



2. For each of the following rules, decide **(a)** whether the rule is a function. Answers may vary depending on what assumptions you make, so be sure to clearly spell out your reasoning and assumptions. If the rule is a function then give **(b)** a domain and **(c)** a range that make sense. Finally, **(d)** either describe the function's inverse, or explain why the function doesn't have one.
- (a) A rule that assigns to a positive number the next highest power of 2. (Example: 11 gets assigned 16.)
 - (b) A rule that assigns to a sentence (let's say in English) the number of words in that sentence.
 - (c) A rule that assigns to a US taxpayer its social security number.
 - (d) A rule that assigns to a date a human born on that date.
 - (e) A rule that assigns to a human its biological mother.
3. Fill in the missing details from the following proof that the slopes of perpendicular lines are negative reciprocals of each other.



To make things a little easier, we'll assume that our two perpendicular lines intersect at the origin. The equation of one line is $y = mx$ and the equation of the line perpendicular to it is $y = m_1x$, as depicted above. We want to end up showing that $m = -\frac{1}{m_1}$. Now consider the figure below.



- (a) If the indicated horizontal distance is 1 unit, what is the vertical distance indicated by the ?? symbol? Similarly, if the indicated vertical distance is 1, what is the horizontal distance indicated by the ? symbol? (Hint: Use your knowledge of slope.)
- (b) Remember back to high school geometry and explain why the two triangles in the figure (the ones whose side lengths you found in part (a)) are equivalent triangles. Use this to show that the sides marked by ? and ?? are of equal length. (Hint: You may want to consider the angle-side-angle correspondence. For the second pair of angles, imagine rotating our pair of perpendicular lines from the position of the xy -axes into their current position.) (Note: In lecture, Professor Paul instead chose to show that the two triangles are *similar* and therefore the ratios of corresponding sides are equal. Feel free to go that route if you prefer.)
- (c) Explain how we know from all this that $m = -\frac{1}{m_1}$. Be sure to clearly explain where the minus sign comes from.
4. (a) Find the equation of the line through $(-2, 4)$ and parallel to $2x - 3y = 4$.
- (b) Suppose a student showed you their work on this problem:
- All you have to do is plug in the point.
 $2(-2) - 3(4) = -4 - 12 = -16$
 So the equation is $2x - 3y = -16$.

This student didn't do a very good job of explaining their work. Try to fill in the blanks and evaluate the student's strategy. First, try to explain what the student did. Does

the strategy make sense? Either give an example where this strategy does not produce the correct equation, or explain why this strategy will always work (for questions like the given example).

5. (a) Solve $|x + 3| < 5$ algebraically. Clearly show each step.
- (b) Using the distance interpretation of absolute value, describe each step above (including the “break into cases” step). If you added 10 to both sides of an inequality, re-interpret the new inequality in terms of distance and say (geometrically) why this new inequality is equivalent to the previous one. You may want to consider drawing a number line for each step.