

# Math 110

Chapter 7 Review Problems  
Due Friday, February 5, 2010

Here are five review problems for Chapter 7 (since the book has none for this chapter), preceded by some basic information about lines. These problems are also due Monday, September 17.

When thinking about lines it is important to remember two of the properties of lines in the plane. The first is that “two points determine a line.” Intuitively, if we have a ruler, we can draw the line connecting the points in the obvious way: align the ruler so that one edge goes through both points and then trace that side of the ruler with a pencil.

The second is that “a point and a slope determine a line.” Recall that the slope of a line is the rise divided by the run (see Chapter 7 of text). Intuitively, if we place the ruler on the graph paper so that the one edge passes through the point and the slope of the ruler is the slope of the line, we can trace that side of the ruler that passes through the point.

Algebraically, there are two different formulas that we can use to describe a line.

**Slope intercept form**  $y = mx + b$ . Here  $m$  is the slope and  $b$  is the  $y$ -coordinate of the point where the line crosses the  $y$ -axis. We can see that this is the case when we substitute 0 for  $x$  (which means the point lies on the  $y$ -axis). We obtain  $y = m \cdot 0 + b$  or  $y = b$ . So the point on the line is  $(0, b)$ , which lies on the  $y$ -axis.

**Point-slope form**  $y - y_1 = m(x - x_1)$ . Here  $m$  is again the slope and  $(x_1, y_1)$  are the coordinates of any point on the line. Sometimes it will be convenient to rewrite this formula by adding  $y_1$  to both sides of the equation. This produces the form  $y = m(x - x_1) + y_1$ .

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## Problems

1. Consider the line connecting the points  $(1, 2)$  and  $(3, -2)$ .
  - (a) Find the slope of the line.
  - (b) Write out the point slope form of the line using the point  $(1, 2)$ .
  - (c) Use your answer to (b) to find the slope intercept form of the line.
  - (d) Write out the point slope form of the line using the point  $(3, -2)$ .
  - (e) Use your answer to (b) to find the slope intercept form of the line.
  - (f) Did the choice of point in (b) or (d) make a difference in your answers to (c) or (e)?
2. Suppose that  $L_1$  and  $L_2$  are lines with positive slope. Which of the following are possible (not all at the same time, of course)?
  - (a)  $L_1$  and  $L_2$  have no points in common.
  - (b)  $L_1$  and  $L_2$  have more than one point in common.
  - (c)  $L_1$  and  $L_2$  are perpendicular.

3. Suppose that two lines,  $L_1$  and  $L_2$ , both pass through the point  $(4, 2)$  and that line  $L_1$  has slope  $\frac{3}{2}$  and line  $L_2$  has slope  $\frac{1}{3}$ . Which of the following statements are true, which are false? (Explain.)
- (a) If a point on  $L_1$  has the same  $x$ -coordinate as a point on  $L_2$ , then the point on  $L_1$  is at the same height or higher than the point on  $L_2$ .
  - (b) If a point on  $L_2$  has the same  $x$ -coordinate as a point on  $L_1$ , then the point on  $L_2$  is at the same height or higher than the point on  $L_1$ .
  - (c) If a point is on both lines, then the point is  $(4, 2)$ .
4. Suppose line  $L$  has slope  $\frac{p}{q}$  where both  $p$  and  $q$  are positive numbers and that  $p > q$ . Is  $L$  steeper than the line  $y = x$  or not? Explain.
5. On a single set of coordinate axes, plot the following lines and find their slope-intercept equations:
- (a) The line through the points  $(2, 0)$  and  $(0, 1)$ .
  - (b) The line through the point  $(0, 1)$  with slope 2.
  - (c) The line parallel to the line from (a) passing through the point  $(1, 3)$ .
  - (d) The line through  $(3, 2)$  that is perpendicular to the line from (c).