Session 2.4

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Notes to keep in mind

Make sure you have these things in your notes, because I will refer to them with the expectation that you have learned, memorized, or written them down.

1. Slope definition: $slope = \dfrac{rise}{run} = \dfrac{y_2 - y_1}{x_2 - x_1}$
2. Slope-intercept form is $y = mx + b$ (m is the slope and b is the y-intercept)
3. Two lines are **parallel** if they have the same slope
4. Points are **collinear** if they lie on the same line. *Note:* it is sufficient to check slopes between all the points are equal (think about it!).
5. Two lines are **perpendicular** if the slope of one is the negative inverse of the other.
   (a) Slopes are m_1 and m_2 and $m_1 = -\dfrac{1}{m_2}$
   (b) The y-intercepts don't matter — only the slopes matter
   (c) Draw it out and see why it makes sense!

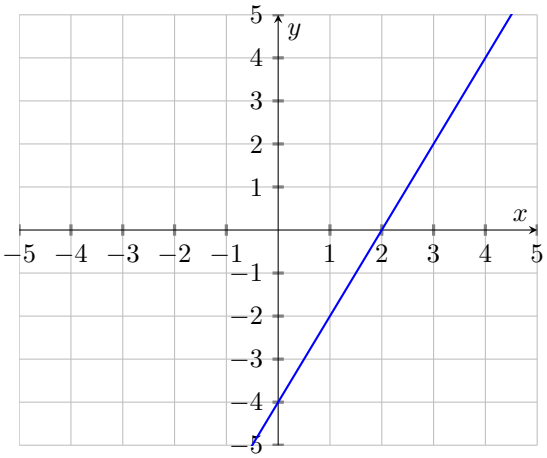
Main problems

1. For each set of three points say whether or not they're on the same line, and prove it.
   (a) $(2, 4), (-3, -5)$, and $(12, 22)$
   (b) $(5, 13), (-2, 5)$, and $(0, 8)$
   (c) $(8, 1), (10, -2)$, and $(2, 8)$
   (d) $(-1, 0), (3, -5)$, and $(-7, -13)$
2. For each line, write two line equations of one that is parallel, and one that is perpendicular
   (a) $y = 3x - 2$
   (b) $y = -2x + 3$
   (c) $y = \dfrac{4}{3}x - 2$
   (d) $y = -\dfrac{3}{5}x + 1$
   (e) $y = 1.2x - 3$
   (f) $y = -1.75x + 4$
3. Write an equation in slope-intercept form that describes the values in the table:

x	3	2	1	-1	-3
y	-14	-11	-8	-2	4

4. Find the y-intercept of a line that has slope 3 and passes through $(6, 12)$.
5. Find the value of p so that the line through $(4, 6)$ and $(12, p)$ is parallel to the line $y = \frac{1}{2}x - 1$.
6. Find an equation of the line through the point $(-3, 2)$ that is perpendicular to the line $y = \frac{3}{5}x - 2$

7. Find the slope and y-intercept and write an equation of the line



8. Denote all possible values of x. Use a number line if you find it more convenient

   (a) $|x| \leq 3$
   (b) $\left|\frac{x}{3}\right| \geq 4$
   (c) $|3x| \leq 6$
   (d) $|x-3| \leq 5$
   (e) $|x+3| \geq 2$
   (f) $|x-2|+3 \leq 3$

9. Graph the following and indicate the peak/trough (corner)

   (a) $y = |x| + 1$
   (b) $y = |2x|$
   (c) $y = \left|\frac{1}{2}x\right|$
   (d) $y = -|x| + 1$
   (e) $y = |x| - 3$
   (f) $y = |x+3|$
   (g) $y = -|x+4|$
   (h) $y = |x-4| + 1$
   (i) $y = |x+2| - 2$
   (j) $y = |x-6| - 3$

10. In general, what happens if we add 2 to an equation (outside the absolute value)? subtract 2? add c (a constant)?

11. In general, what happens if we multiply the equation by -1?

12. In general, what happens if we add 2 to x in an equation (inside the absolute value)? subtract 3? add c (a constant)?

More problems

1. Work on: 2014 AMC 10A
2. Work on: 2011 AMC 8