Math 251 **Workshop 00: Coordinates revisited**

September 6, 2013

Due: Not collected Name: _____

1 Workshop 00

We'll do these a couple of times a week. They are usually collected a few days later. This one won't be collected.

1.1 Coordinates revisited

The first major topic in this course is the geometry of 3-dimensional Euclidean space $\mathbf{R}^3$. Many people struggle with visualizing in this space or find it difficult to translate coordinate information into geometric information. This workshop will encourage you to rethink coordinates in the familiar Euclidean plane in preparation for the later discussion.

- As you work through the questions, check your answers with either Rainier or Dr. Rosoff before going on.
- Raise a hand if you are really stuck.
- Talk a lot! Class goes better the more you talk to each other.

1.2 Coordinates

Draw a coordinate plane on your whiteboard, and plot the line $y = 2$.

1. What do all the points on the line $y = 2$ have in common? Answer as *clearly* and *succinctly* as you can. (Try to avoid referring to points' coordinates. The idea here is to remember how coordinates are defined in the first place.)

2. Give the best definition you can for the idea of "distance between a point and a line".

3. What do all the points on the line $x = -3$ have in common? What's the difference between $x = -3$ and $x = 3$?

4. How do you plot points? Where's the point $(2,3)$? What does this point have to do with the lines you have been drawing?

5. Now draw yourself a 3-space, like on the board. What are the points $z = -1$? What shape do they make? Try to draw this shape.

6. Draw $y = -2$ in your 3-space. What's the difference between $y = -2$ and $y = 2$? Now Try to draw $x = 4$ in your 3-space. Where does $(4,2,-1)$ live?

7. Given two points (x_0, y_0, z_0) and (x_1, y_1, z_1), write down a formula for the square of the distance between them. Use the definitions of the coordinates you've figured out. If you are having trouble, try the exercise in just 2 dimensions first.