Math 323 - Formal Mathematical Reasoning and Writing
Problem Session
Wednesday, 1/28/15

Warm Up:

1. Define the terms **even** and **odd**.
2. Define the statements $\mathbf{a < b}$ and $\mathbf{a > b}$.

Practice Problems:

Write up solutions for the following problems in the same amount of detail you would use in a homework assignment.

1. Prove that for every integer x, if x is odd then x^3 is odd.
2. Describe in one or two sentences how you would show that the following statement is false.

   For every integer a, if a is even then $a^3 - 1$ is even.

3. Decide whether the following statement is true or false. If the statement is true, prove it. If the statement is false, give a counterexample to show that it is false.

   If $p < 0$ and $mp < np$ then $n < m$.

   (*First: Can you prove (or disprove) this statement with the theorems discussed in class? What modification(s) should we make to the statement before our theorems apply?*)

4. [1]Decide whether the following statements are true or false. If the statement is true, prove it. If the statement is false, give a counterexample to show that it is false.

   (a) For all integers x, y, if $xy > 0$ then $x^2 + y^2 > 0$.

   (b) For all integers x, y, if $x^2 + y^2 > 0$ then $xy > 0$.

From Problem Set 2:

PS2 #5 Decide whether the following statement is true or false:

If $a, b, c, d \in \mathbb{Z}$ and $a < c$ and $b < d$, then $ac < bd$.

If the statement is true, prove it. If the statement is false, give a counterexample to show that it is false, and then come up with a revision of the statement that is true, and prove it.

PS2 #6 **Mathematical Virtue** Do you have ideas about how to prove #6 on Problem Set 2? What are the examples of multiplous and non-multiplous sets that you have come up with?

[1]One of these is easy. The other one is hard.