CSE191, Fall 2013 **Assignment 5** **Due Fri. 10/25**

Reading: For next week, please read section 2.4, skim 2.5, and read 2.6. Then skim chapter 3, which intersects with the syllabus of CSE116 and CSE250, and which we may jump back to when covering chapter 5. It is possible that by Friday of next week we may be in chapter 4, which is a central topic.

(1) Rosen, page 91, problem 8. First state it as a proposition in first-order logic with arithmetic (called FOL for short), say what you regard the domain as being, and then prove it. Your proof may be "informal"—i.e., you do not have to give every step with a formal name—but you should be formal about its top-level structure: is it a direct proof, a proof by contradiction, does it use contrapositive, things like that. (15 pts. total)

(2) Rosen, page 91, problem 26. Same rules as (1), and note that this is similar to problem 18 which was given out last time. (18 pts. total)

(3) Rosen, page 91, problem 28, using the reals $\mathbb{R}$ as the domain (not the integers even though the use of the letters m and n suggests it). Which implication is quick and easy to prove? For the other one, try a direct proof by appeal to the fact (which you may take as given) that for any real numbers a and b, $a \cdot b = 0 \iff a = 0 \vee b = 0$. (12 pts. total)

(4) Rosen, page 91, problem 30. Did you use a "circle" of three implications $(i) \longrightarrow (ii) \longrightarrow (iii) \longrightarrow (i)$, or did you prove (ii) and (iii) individually equivalent to (i)? (12 pts. total)

(5) Rosen, page 108, problem 18. This time, for the part where you show uniqueness, use a proof by contradiction rather than a direct proof. That is, if there are two or more different such numbers n, then contradict the fact that the minimum distance between different integers is 1 (which you don't have to prove). (12 pts.)

(6) Rosen, page 136, problem 18, parts (d) and (e) only. Give **both** a Venn-style "picture proof" and a formal proof *using the logical translations of these statements*, showing that (d) yields an "anti-tautology" and (e) an equivalence. (15 pts. total)

(7) Rosen, page 152, problem 2. (6 points only, for 90 total on the set).

Extra Credit: The starred exercise 40 on page 177, which gives what Wednesday's lecture called the "Lite" proof of Cantor's Theorem. (18 points.)