Last name _____

First name _____

LARSON—MATH 353–HOMEWORK WORKSHEET 03

Suggestions: Write out lots of examples. Collect evidence. Doodle. You won't sit down knowing the right idea. But it **will** come if you start early, wrestle with the problem, read, sleep on it, and come back to it.

1. Suppose a, b and n are positive integers. Prove that if $a^n | b^n$, then $a | b$.

2. Suppose p is a prime and a and k are positive integers. Prove that if $p | a^k$, then $p^k | a^k$.

3. Prove that if a positive integer n is a perfect square, then n cannot be written in the form $4k + 3$ for k an integer. (Hint: Compute the remainder upon division by 4 of each of $(4m)^2$, $(4m + 1)^2$, $(4m + 2)^2$, and $(4m + 3)^2$.)

4. Prove that no integer in the sequence $11, 111, 1111, 11111, 111111, \dots$ is a perfect square. (Hint: $111111 = 111108 + 3 = 4k + 3$.)