Name (Last, First): _____ Student ID: _____

Dror Bar-Natan: Classes: 2015-16: MAT 475 Problem Solving Seminar: http://drorbn.net/16-475

Quiz 10 on March 31, 2016: "Argue by Contradiction" and "Pursue Parity". You have 30 minutes to solve the following three problems. Please write on both sides of the page. **Good Luck!**

Problem 1 (Larson's 1.10.4, reworded). Let n be an odd integer and let A be a symmetric $n \times n$ "Latin" matrix - every row and every column in A is a permutation of $\{1, 2, \ldots, n\}$. Show that the diagonal of A is also a permutation of $\{1, 2, \ldots, n\}$.

Problem 2. Can you pack 125 boxes of size $4 \times 2 \times 1$ inside one cube of size $10 \times 10 \times 10$? If you wish to refer to one of the figures on the right, state clearly whether it is figure **A** or **B**.

Problem 3. (Larson's 1.10.10, reworded). Show that for every positive integer a, the equation $x^2 - y^2 = a^3$ has solutions with $x, y \in \mathbb{Z}$.