# CS 311 — Fall 2011 — Homework 4 — Due Sept. 16

1. What are Polya's steps in problem solving? Name them and describe each in a sentence or two.

   For each of the following, you are to prove the theorem, but show how you have developed your proof by the naming the methods (Forward-Backward, Construction, Choose, Specialization)[1] that you are using and labeling the steps A1, A2, ..., B1, B2, ... as we have done in class. *You will not receive full credit if you do not identify the methods and label the steps!*

2. If $s$ and $t$ are rational and $t \neq 0$, then $s/t$ is rational. (Recall that a number is rational if it can be expressed as the ratio of two integers.)

3. The equation $x^2 - 5x/2 + 3/2$ has a real solution.

4. If $a$, $b$, and $c$ are real numbers with $a \geq 0$, then the function $f(x) = ax^2 + bx + c$ satisfies the property that for all real numbers $x$ and $y$, $f(x) \geq f(y) + (2ay+b)(x-y)$.

5. If $n$ is an integer greater than 2, $a$ and $b$ are the lengths of the legs of a right triangle, and $c$ is the length of the hypotenuse, then $c^n > a^n + b^n$.

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[1]We will cover the Choose and Specialization Methods on Monday, but if you want to start on your homework, you can probably figure them out for yourself from the file "Summary of proof techniques from Solow" on the course website.