SOME MADMAN'S RAVINGS

GISPISQUARED

Contents

Part 1. Methods of Proof

Since I refuse to rehash stuff that others have done better, I'll refer you to a couple of resources about how to write proofs properly:

- How to Write a Maths Solution
- Chapter 1 of the OTIS Excerpts

Cool, hopefully now you know how to write proofs. Guess that means every time you solve a problem you'll get a 7, right?

Now it's time to learn how to actually prove something. There are a few main methods of proof — that is, ways in which you can go from the conditions in the problem to your given condition.

1. Direct Proof

This is perhaps the simplest type of proof. The idea is to start only with the stuff you're given, and finish with what you want to prove.

Time for an example.

Example 1. *Let a, b be positive real numbers. Prove that*

$$\frac{a+b}{2} \geq \sqrt{ab}.$$

Solution

Part 2. Theory

Part 3. Practice

Part 4. Problems

Part 5. Proofs

Problem

Proof. Since squares are nonnegative, we have

$$\begin{aligned} & \left(\sqrt{a}-\sqrt{b}\right)^2 \geq 0 \\ \iff & a+b-2\sqrt{ab} \geq 0 \\ \iff & a+b \geq 2\sqrt{ab}. \end{aligned}$$

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