HW0:CAB8XD

Collaboration Policy: You are encouraged to collaborate with up to 4 other students, but all work submitted must be your own independently written solution. List the names of all of your collaborators. Do not seek published solutions for any assignments. If you use any published resources when completing this assignment, be sure to cite them. Do not submit a solution that you are unable to explain orally to a member of the course staff.

PROBLEM 1 *I cannot live without...*

Include a passage from your favorite book.

"I can see what you're up to."
"Five foot six inches," Shallan said. "I suspect that's all I will ever be up to, unfortunately."
– Brandon Sanderson, *Words of Radiance*

PROBLEM 2 *The Finest Gambit*

> *Reductio ad absurdum*, which Euclid loved so much, is one of a mathematician's finest weapons. It is a far finer gambit than any chess play: a chess player may offer the sacrifice of a pawn or even a piece, but a mathematician offers the game. [Excerpt from *A Mathematician's Apology*, G.H. Hardy, 1940, p. 94]

Learn how to write math and construct proofs by reproducing the proof below. You will need to use the `eqnarray` environment, as well as the `eqnarray*` environment.

Definition 1 *A rational number is a fraction $\frac{a}{b}$ where a and b are integers.*

Show $\sqrt{2}$ is irrational.
Proof.
For a rational number $\frac{a}{b}$, without loss of generality we may suppose that a and b are integers which share no common factors, as otherwise we could remove any common factors (i.e. suppose $\frac{a}{b}$ is in simplest terms). To say $\sqrt{2}$ is irrational is equivalent to stating that 2 cannot be expressed in the form $(\frac{a}{b})^2$. Equivalently, this says that there are no integer values for a and b satisfying

$$a = 2b^2 \tag{1}$$

We argue by *reductio ad absurdum* (proof by contradiction). Assume toward reaching a contradiction that Equation 1 holds for a and b being integers without common factor between them. It must be that a^2 is even, since $2b^2$ is divisible by 2, therefore a is even. If a is even, then for some integer c

$$\begin{aligned} a &= 2c \\ a^2 &= (2c)^2 \\ 2b^2 &= 4c^2 \\ b^2 &= 2c^2 \end{aligned}$$

therefore, b is even. This implies that a and b are both even, and thus share a common factor of 2. This contradicts our hypothesis, therefore our hypothesis is false. □

PROBLEM 3 *Images*

Learn how to include drawings in your documents with the `\includegraphics{file}` command. Create an original drawing and save it as an image. Include it at the end of this document. Your image prompt is: "This is what computer science means to me".

Saving the world < Runtime Error XxXxX

:,)