Prove the following propositions. Format your proof so each step of the proof is on its own line; each line should still be a complete sentence. Below, I have entered a nonsensical proof as a model.

Proposition 1. Suppose $a, b, c \in \mathbb{Z}$. If $a^2 + b^2 = c^2$, then a or b is even.

Proof. Suppose that x and y are real numbers and that $x > y$.

Then, $x - y > 0$.

Let $\varepsilon \in (0, x - y)$.

Then we have $x - y \geq \varepsilon$.

The above is an example of how to format your proof with one sentence on each line. Please do this when you submit your proofs! □

Proposition 2. Suppose $x, y \in \mathbb{Z}$. If $x + y$ is even, then x and y have the same parity.

Proof. □

Proposition 3. If $a \equiv b \pmod{n}$, then $\gcd(a, n) = \gcd(b, n)$.

Proof. □