Problem something of chapter something

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If you want to write something you can just type like this. \LaTeX{} will automatically indent and space as appropriate to the document.

If you want a new paragraph, you’ll need to skip a line. You can put each sentence on its own line and put as many spaces in as you want: \LaTeX{} ignores most whitespace.

**Definition 1.** A definition could go here if you wanted.

Right now Definition 1 isn’t really a definition. But we can still talk about it using the \texttt{ref} command.

**Proposition 1.** The equation \(x^2 - 4y - 2 = 0\) has no integer solutions.

In symbols the proposition is

\[ \forall x, y \in \mathbb{Z}, x^2 - 4y - 2 \neq 0. \]

**Proof.** Suppose (by way of contradiction) the equation \(x^2 - 4y - 2 = 0\) has an integer solution. Let \(a, b \in \mathbb{Z}\) be that solution. Hence \(a^2 - 4b - 2 = 0\). Consequently \(a^2 = 4b + 2 = 2(2b + 1)\). Thus \(a^2\) is even. It then follows from earlier work that \(a\) is even. By definition (of even) there is an integer \(c\) such that \(a = 2c\). Hence \(a^2 = (2c)^2 = 4c^2 = 2(2b + 1)\). Dividing by 2 shows that \(2c = 2b + 1\). This is a problem because \(2c\) is even but \(2b + 1\) is odd. We have reached a contradiction; our starting assumption must have been false. Therefore the equation \(x^2 - 4y - 2 = 0\) has no integer solutions. \(\square\)