CSE 311: PRACTICE WITH PROOFS

Definitions
The following are definitions that will be useful in your proofs:

Def 1.1: Let $a, b \in \mathbb{Z}$. Then **a divides b**, written $a|b$, if $\exists c \in \mathbb{Z}$ such that $b = ac$.

Def 1.2: We say an integer x is **even** if $x = 2k$ for some $k \in \mathbb{Z}$. An integer y is **odd** if $y = 2j + 1$ for some $j \in \mathbb{Z}$.

Def 1.3: Let $a, b \in \mathbb{Z}$, and $n \in \mathbb{N}$. Then $a \equiv b \pmod{n} \leftrightarrow n|(a - b)$.

Def 1.4: Let A and B be sets. Then $A \subseteq B \leftrightarrow \forall x (x \in A \rightarrow x \in B)$.

Practice Proofs
See if you can apply some of the tips located in the "Proof-Writing Tips" worksheet in the following problems:

1. Let $A = \{x \in \mathbb{Z} : 18|x\}$ **and** $B = \{x \in \mathbb{Z} : 6|x\}$. **Prove that** $A \subseteq B$.

2. Show that if $x^2 - 6x + 5$ **is even for** $x \in \mathbb{Z}$, **then** x **is odd.**

3. Prove that if $x \equiv 14$ **(mod 25), then** $x \equiv 4$ **(mod 5).**

4. Suppose $B \neq \emptyset$ **and** $A \times B \subseteq B \times C$. **Prove** $A \subseteq C$.