1. Three propositional variables a, b, and c are defined as follows:

   - a: Sam studied for his test.
   - b: Sam's test was easy.
   - c: Sam passed his test.

   Give a logical expression that is equivalent to each sentence below using the propositional variables.

   (a) Sam passed his test, even though the test was not easy.

   (b) If Sam's test was easy or he studied for it, then he passed.

   (c) Sam passed his test only if he studied for it.

2. Define the function $f : \{0,1\}^3 \to \{0,1\}^3$ such that $f(x)$ is obtained from x by replacing the last bit with 1. (For example $f(110) = 111$ and $f(001) = 001$.) Is f onto? Is f one-to-one? If it is not one-to-one, give a specific example.

3. The sets A,B, C are defined as follows:

   - $A = \{x \in \mathbb{Z} : x \text{ is odd}\}$
   - $B = \{1, 3, 5, 7\}$.
   - $C = \{2, 3, 4, 5\}$.

   Circle the following expressions that are true:

   (a) $|B| = |C|$

   (b) $B \subseteq A$

   (c) $(4, 5) \in B \times C$

   (d) $A \cap C \subseteq B$.

   (e) $B \cup C = \{3, 5\}$.

   (f) $4 \in A \cup C$.

4. Define the function $g : \{0,1\}^3 \to \{0,1\}^3$ such that $g(x)$ is obtained from x by swapping the first bit and the last bit. (For example $g(100) = 001$.) Is g onto? Is g one-to-one? If it is not one-to-one, give a specific example.

5. Express the following using summation notation: the sum of the squares of the odd integers between 0 and 250.