Name: **Section:**

Computer Science 243
Spring 2025
Homework 4

Due: 11:59 p.m., Wednesday, 2/19/25 **Points: 50**

Answer the following questions and show your work. Your final submission must be completely your own work.

1. [6 points] Use a direct proof to show that the product of an even and an odd integer is even.

2. [6 points] Use a proof by contraposition to show that if 3n + 7 is even, then n is odd.

3. [6 points] Use a proof method to prove or disprove that no odd integers are cubes. State your proof method and show your proof.

4. [3 points each] Based on a domain of all letters in the English alphabet, let

   $A = \{s, c, i, e, n\}$
   $B = \{a, e, i, o, u\}$
   $C = \{c, o, m, p, u, t, e, r\}$

   a. Draw a Venn diagram showing the sets above.
   b. What is $\overline{A} \cap (C - B)$?
   c. What is $|\ \overline{A \cup B \cup C}\ |$?
   d. What is $P(B - C)$?

5. [3 points each] Based on the following sets,

   $A = \{\emptyset\}$
   $B = \{\emptyset, \{\emptyset\}\}$
   $C = \{\emptyset, a\}$

   a. What is $B \times C$?
   b. What is $|\ A \times A\ |$?
   c. Is $A \in B$? Is $A \subseteq B$?
   d. What is $|\ A \cup B \cup C\ |$?
   e. What is $P(C)$?

6. [5 points] Let A, B, and C be sets. Prove or disprove that $A - (B \cap C) = (A - B) \cup (A - C)$ using a membership table. State whether your membership table proves or disproves the statement and why.