Student's Name:
ID: **Teacher's Name:**

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Q#1: Determine whether each of the following statements is true or false: (6 marks)

1) $\{a\} \in \{a, b, c, d\}$.

2) $\overline{A \cup \bar{A}} = \emptyset$

3) $(A \times B) \times C = A \times B \times C$.

4) If $f : A \to B$ is a function and $S \subseteq A$ then $f(S \cap \bar{S}) = f(S) \cap f(\bar{S})$.

5) If A and B are two sets with the same power sets then $A = B$.

6) A function $f : A \to B$ with $|A| < |B|$ must be one to one.

Q#2: Fill in blanks with the correct answers only: (9 marks)

1) Let $A_i = [-2i, i^2 + 1], i = 1, 2, 3, \ldots \ldots$ then

$$\bigcup_{i=1}^{\infty} A_i = \underline{\hspace{3cm}} \text{and} \bigcap_{i=1}^{\infty} A_i = \underline{\hspace{3cm}}$$

2) The power set of $S = \{0, 1, \{0\}\}$ is$\underline{\hspace{5cm}}$

3) The solution set of the equation $\lceil 5 - 3x \rceil = 2$ is:$\underline{\hspace{5cm}}$

4) If $f(x) = \lfloor \sqrt{9 + x^2} \rfloor$ then $f(\mathbb{R}) = \underline{\hspace{4cm}}$

5) To prove that the statement $p \to q$ is true trivially we show that$\underline{\hspace{3cm}}$.

6) Let U be a universal set with 5 elements. The bit string that represents
U is:$\underline{\hspace{4cm}}$

7) $\lceil 2.5 + \lfloor 1.3 * -1.5 \rfloor \rceil = \underline{\hspace{4cm}}$.

8) If A and B are sets then $(A \cap B) \cup (A \cap \bar{B}) = \underline{\hspace{4cm}}$.

Q#3: Use mathematical induction to show that   (5 marks)
$$4^n > n^2 \text{ for } n \geq 1.$$

Q#4: Show that if $x \in \mathbb{Z}$ and $x^2 - 6x + 5$ is an even integer then x is an odd integer.
   (Write down the name of the method you use to prove)   (5 marks)

Best Wishes