MATH 250 **Name:** _____

Exam I **Row:** _____

Exam I has questions 1 through 7 with a total of 100 points. This exam is printed on both sides of the paper.

1. True or False:

[5] (a) _____ $\varnothing = \{\varnothing\}$.

[5] (b) _____ $\varnothing \subset \{\varnothing\}$.

[10] 2. Write the *contrapositive* of the statement *If an integer n is even, then $2n+2$ is even.*

[10] 3. Write the *converse* of the statement *If an integer n is even, then $2n+2$ is even.*

[10] 4. Give an example of a *conditional statement that is true,* but whose converse is false.

5. Enumerate the members of each set:

10 (a) $\{1, 2, \sqrt{5}\} \cap \{1, 2, \sqrt{2023}\}$

10 (b) $\{1, 2, \sqrt{5}\} \cup \{1, 2, \sqrt{2023}\}$

10 (c) $\{1, 2, \sqrt{5}\} \setminus \{1, 2, \sqrt{2023}\}$

10 6. Using a truth table, show that $P \implies Q$ is logically equivalent to $\neg Q \implies \neg P$.

7. Let A and B be sets.

10 (a) Write the *contrapositive* of the statement $A \setminus B = A \implies A \cap B = \varnothing$.

10 (b) Using the contrapositive, show that $A \setminus B = A \implies A \cap B = \varnothing$.