The empty set is a subset of every set. This is because the empty set is a collection of no elements, so it cannot contain any elements that are not in any other set. In other words, the empty set is a subset of every set because there are no elements in the empty set that are not also in any other set.

\[ \emptyset \subseteq A \]

In formal terms, a subset of a set is a collection of elements that are all elements of that set. If a set A is a subset of set B, then every element in A is also an element in B. This is written as:\n
\[ \forall x (x \in A \rightarrow x \in B) \]

This means that for all elements x, if x is in A, then x is also in B. This is the definition of a subset in set theory.
\[
\begin{align*}
\left( (a \land q) \land (\neg q) \right) & = (\neg q) \\
\left( (a \land \neg q) \land (\neg q) \right) & = \neg q
\end{align*}
\]

and note that, \( x \not\in X \) and hence
\[
\left( \neg q \right) = \neg q
\]
Exercise

Consider the function $f(x, y) = x^2 + y^2$. Find the partial derivatives $f_x$ and $f_y$.

Solution

The partial derivative of $f(x, y)$ with respect to $x$ is $f_x(x, y) = 2x$.

The partial derivative of $f(x, y)$ with respect to $y$ is $f_y(x, y) = 2y$.

Therefore, the partial derivatives of $f(x, y)$ are $f_x(x, y) = 2x$ and $f_y(x, y) = 2y$. The domain of these partial derivatives is all real numbers, as $f(x, y)$ is defined for all $x$ and $y$. The partial derivatives can be graphed to visualize the rate of change of $f(x, y)$ with respect to $x$ and $y$.