Problems

1. De Morgan’s Laws are as follows:
\[
\neg (A \land B) = \neg A \lor \neg B \\
\neg (A \lor B) = \neg A \land \neg B
\]

Prove the above laws using truth tables.

2. Describe the following operators using some combination of \( \neg, \lor \) and \( \land \):
   
   (a) \( \implies \)
   
   (b) \( \iff \)

3. Given that the following statements are true, derive the truth value of \( A \).
\[
C \implies \neg D \\
A \iff D \\
C \land B
\]

4. Prove that the negative of any irrational number is irrational.

5. Prove that the sum of squares of the first \( n \) positive integers is \( \frac{n(n+1)(2n+1)}{6} \).