5. If \( n \) is an integer that is greater than 1, then

\[ n \text{ is prime} \iff \forall \text{ positive integers } r \text{ and } s, \]
\[ \text{if } n = r \cdot s \text{ then } r = 1 \text{ or } s = 1. \]

\[ n \text{ is composite (not prime)} \iff \forall \text{ positive integers } r \text{ and } s \text{ such that } n = r \cdot s \]
\[ \text{and } r \neq 1 \text{ and } s \neq 1. \]

Prove: \( n^2 + 3n + 2 \) is not prime.

**Proof by contradiction:**

Let \( n^2 + 3n + 2 = r \cdot s \)

Assume \( r = 1 \) and \( s = 1 \)
\[ n^2 + 3n + 2 = r \cdot s = 1 \]
\[ n^2 + 3n = -1 \]
but \( n^2 + 3n \) cannot be -1 because \( n \) is an integer greater than 1.

This introduces a contradiction

So this proves that \( r \neq 1 \) and \( s \neq 1 \).

Thus \( n^2 + 3n + 2 \) holds for the composite case and is not prime.