Name: __________________________

Quiz 4, CSCE 222-502

1. Determine the truth value of each of these statements if the domain for all variables consists of all integers.
   a. \( \forall n(n^2 \geq n) \) True
   
   b. \( \exists n(n^2 < 0) \) False (nothing squared results in a negative num)

2. Prove that if \( n \) is an integer and \( 3n + 2 \) is even, then \( n \) is even using either a proof by contraposition or a proof by contradiction.

So proving \( 3n + 2 \) is even \( \rightarrow \) \( n \) is even

a. Contraposition:
   Take contrapositive
   \( \neg(n \text{ is even}) \rightarrow \neg(3n + 2 \text{ is even}) \)
   Essentially \( n \) is odd, then \( 3n + 2 \) is odd. Assume \( n \) odd. So

   \[ n = 2k + 1 \]

   \[ 3n + 2 = 3(2k + 1) + 2 = 6k + 5 = 2(3k + 2) + 1 \text{ << this is odd therefore } 3n + 2 \text{ is even} \]

b. Contradiction:
   \( 3n + 2 \) is even so suppose/assume that \( n \) is odd
   \( 3n + 2 \) is even means that \( 3n \) is even as well
   Subtracting an odd number (\( n \)) from an even number (\( 3n \)) results in an odd number.
   So \( 3n - n = 2n \text{ << Obviously wrong since 2 times anything is even. This is a contradiction, so the supposition/assumption that } n \text{ is odd is incorrect so } n \text{ must be even} \).