Quiz 1

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1. (1 point) Which of the following is the negation of the statement "For each even integer n, there exists an integer k such that $n = 2k$"?
   - √ **There exists an even integer n such that for all integers k, $n \neq 2k$.**
   - ◯ For all odd integers, there exists an integer k such that $n \neq 2k$.
   - ◯ There exists an odd integer n such that there exists an integer k with $n = 2k$.
   - ◯ For all even integers n and for all integers k, $n \neq 2k$.
2. (1 point) __**F**__ True or False: The supremum of a set is the largest element in the set.
3. (1 point) __**F**__ True or False: Every set has a supremum.
4. (1 point) Complete the following definition: The **supremum** of a set A is the ______________ upper bound of A.

   Solution: The **supremum** of a set A is the **least** upper bound of A.

5. (1 point) Identify the error in the following proof that $\forall n \in \mathbb{N}$,

$$1 + \cdots + n = \frac{n(n+1)}{2}$$

Proof. Suppose $1 + \cdots + n = \frac{n(n+1)}{2}$ for some $n \in \mathbb{N}$. Then,

$$\begin{aligned} 1 + \cdots + n + 1 &= 1 + \cdots + n + n + 1 \\ &= \frac{n(n+1)}{2} + n + 1 \\ &= \frac{n(n+1) + 2(n+1)}{2} \\ &= \frac{(n+1)(n+2)}{2}. \end{aligned}$$

Hence, by mathematical induction, the result holds for all natural numbers. □

Solution: The author did not include the base case.