Answer on Question#70601 – Math – Calculus

Question. $\varphi(n) = n - 1 \; \forall n \in \mathbb{N}$, where φ is the Euler-phi function. Is this statement true? Justify your answer.

Solution. By the definition of the Euler-phi function

(see https://en.wikipedia.org/wiki/Euler%27s_totient_function) it counts the positive integers up to a given integer n that are relatively prime to n.

Let us put $n = 9$. Then there are six positive integers up to 9 that are relatively prime to 9:

1, 2, 4, 5, 7, 8. (see https://en.wikipedia.org/wiki/Euler%27s_totient_function). Then we conclude that $\varphi(9) = 6 \neq 8 = 9 - 1$. We provided counterexample, so generally speaking $\varphi(n) \neq n - 1$. The statement is false.

Answer. The statement is false.