PROOFS AND PROBLEM SOLVING

10-27-2025

10.9 (Chapter 10) Prove using induction $5^{2n} - 1$ is divisible by 8.

First step: n=1 : $5^2 - 1 = 24$ is divisible by 8.

Assume true for n.

Need to prove for n+1 using result for n.

$5^{2(n+1)} - 1 = 5^{2n+2} - 1 = (5^{2n}(25)) - 1 =$

We know $5^{2n} - 1 = 8m$ for some integer m. So $5^{2n} = 8m + 1$ and this can be used in above equation.

$((8m + 1)$25)-1 = 8m(25) + 25-1 = 8m(25) + 24 which is a multiple of 8.