Lemma 1. *Prove that if n is even,* $(-1)^n = 1$.

Proof. Let n be an integer, and assume it is even. By definition, there exists an integer k such that n = 2k. Hence, $(-1)^n = (-1)^{2k} = (-1^2)^k$. $(-1)^2 = 1$, and 1 to the power of any number k equates to 1. ■