

Name: _____

Problem 1. *Prove by mathematical induction that for all natural numbers n , $6n^2 + 2n$ is divisible by 4.*

Solution. Base case: For $n = 0$, $6n^2 + 2n = 0$ which is divisible by 4.

Inductive step: Suppose $6n^2 + 2n$ is divisible by 4. That is $\exists r \in \mathbb{Z} : 6n^2 + 2n = 4r$. Now $6(n+1)^2 + 2(n+1) = 6(n^2 + 2n + 1) + 2n + 2 = 6n^2 + 2n + 12n + 8 = 4r + 4(3n + 2) = 4(r + 3n + 2)$ which is divisible by 4. $\square$