General Proofs

John Butler

Contents

0.1 Lemma: $\forall n \in \mathbb{N}$, $\exists k \in \mathbb{N} : n = 2k$ or $n = 2k+1$

$$\begin{array}{c|c}
\text{case } n = 0 & \text{case } n = 1 \\
0 = 2 \cdot 0 & 1 = 0 + 1 \\
 & 1 = 2 \cdot 0 + 1 \\
\text{Let } k = 0 & \text{Let } k = 0 \\
0 = 2k & 1 = 2k + 1
\end{array}$$

Assume $n - 1 = 2k$, or $n - 1 = 2k + 1$

$$\begin{array}{c|c}
\text{case } n - 1 = 2k & \text{case } n - 1 = 2k + 1 \\
n = 2k + 1 & n = 2k + 2 \\
 & n = 2(k + 1) \\
 & \text{Let } k' = k + 1 \\
 & n = 2k'
\end{array}$$