Math 2300, Spring 2020

Proofs using the Principle of Mathematical Induction

Principle of Mathematical Induction (Epp, p. 246)

Let P(n) be a property that is defined for integers n, and let a be a fixed integer. Suppose the following two statements are true:

1. P(a) is true.
2. For all integers k ≥ a, if P(k) is true then P(k + 1) is true.

Then the statement

for all integers n ≥ a, P(n)

is true.

Dr. Martin's 5 step method to prove P(n) for all integers $n \geq n_0$.

1. **Base Case:** $\boldsymbol{P(n_0)}$

   If it is an equation be sure to check both sides separately.

2. Write down the Induction Hypothesis: n=k

   Where k is a particular, but arbitrary integer greater than or equal to n_0

   Let $\boldsymbol{k} \in \mathbb{Z} \ni \boldsymbol{k} \geq \boldsymbol{n_0}$ **and suppose P(k)**

3. Write down what needs to be proved: n = k + 1

   We must show that P(k+1)

4. Show P(k) implies P(k+1) by clear and convincing argument, usually starts:

   Consider P(k+1)

5. Conclusion

   By PMI P(n) $\forall \boldsymbol{n} \in \mathbb{Z} \ni \boldsymbol{n} \geq \boldsymbol{n_0}$