Lecture 10 Handout

**Approach to Proofs by Induction**

1. State the problem exactly as given.
2. State the inductive hypothesis.
3. Write the basis case.
4. Prove the basis case.
5. Write the induction step

**Given** *Write the expression for the (k)th step***Prove**

*Write the expression for the (k+1)th step*

1. Beginning with the left side of the expression for the (k)th step, determine what you must do to get to the left side of the expression for the (k+1)th step.
2. Add the same quantity both sides of the expression for the (k)th step
3. Do the algebra to show that you get the expression for the (k+1)th step

**Proof by Induction Example**

This example is taken from Slide 8 of Lecture 10.

**Prove:**

Using summation notation,

**Inductive Hypothesis**

**Basis Case**

And the basis case is proven.

**Induction**

Given:

Must show:

Beginning with P*(k)*

What can we do to the left side of *P(k)* to produce the left side of *P(k+1)*?

Look at the inductive hypothesis. Determine the value of the *(k+1)*th term on the left side. This means we must Add *(k + 1)* to both sides of *P(k)*

That is, if we add *(k + 1)*  to the left side of *P(k)* , we get the left side of *P(k+1)*

Adding (k+1) to both sides of P(k) we get

Finding a common denominator for the right side

Expanding

Collecting like terms

And finally factoring to obtain

Bob’s Your Uncle.