5.1 Mathematical Induction

**Q10. Find a formula for**

**by examining the values of this expression for small**

**values of n ?**

first we should find few terms

1/2

1/2 + 1/ 6= 2/3

1/2 +1/6 + 1/12 = 3/4,

Then we guess that the sum is n/(n + 1).

**b) Prove the formula you conjectured in part (a).**

by induction, for n = 1 there is just one term 1/2.

Suppose that is true.

We want to show [

we will replace the quantity in brackets in the left by

then do algebra

which complete our prove.

**Q19. Let P(n) be the statement that**

**where n is an integer greater than 1.**

**a) What is the statement P(2)?**

By substitute n = 2 we get

**b) Show that P(2) is true, completing the basis step of**

**the proof.**

It is true because is less than

**c) What is the inductive hypothesis?**

**d) What do you need to prove in the inductive step?**

For each k ≥ 2 that implies P(k+1);

we can show

**e) Complete the inductive step.**

**=**

**f ) Explain why these steps show that this inequality is**

**true whenever n is an integer greater than 1.**

We have completed mathematical induction prove, so the statement is true for every integer n greater than 1.

**Q27. Prove that 2 divides + n whenever n is a positive integer.**

Basis step: 1 + 1 = 2 is divisible by 2.

Inductive step: Assume that k2 + k is divisible by 2.

Then +(k+1) = +2k+1+k+1 = (+k)+2(k+1),

the sum of a multiple of 2 (by the inductive hypothesis) is divisible by 2(by defintion).