



TOPIC : 4 – Tutorial 4

1. Prove, by mathematical induction, that for all  $n \geq 1$ ,  $n^3 + 2n$  is a multiple of 3.
2. Prove by the principle of mathematical induction for a positive integer,  
$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}.$$
3. Use mathematical induction to show that  $\frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \dots + \frac{1}{\sqrt{n}} > \sqrt{n}, n \geq 2.$
4. Use the mathematical induction to prove the inequality  $n < 2^n$  for all positive integer  $n.$
5. Use mathematical induction to show that  $1 + 2 + 2^2 + \dots + 2^{n-1} = 2^n - 1$  for all non negative integers  $n.$

Using mathematical induction prove that

$$1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}.$$