ASSIGNMENT CLASS XI

MATHEMATICAL INDUCTION

Using the principle of mathematical induction, for all $n \in N$, prove that:

(i) $1+4+7+...+(3n-2)=\frac{1}{2}n(3n-1)$

(ii) $\frac{1}{1.3}+\frac{1}{3.5}+\frac{1}{5.7}+...+\frac{1}{(2n-1)(2n+1)}=\frac{n}{2n+1}$

(iii) $1.3+2.4+3.5+...+n(n+2)=\frac{1}{6}n(n+1)(2n+7)$

(iv) $3^{2n}+7$ is divisible by 8

(v) $4^n+15n-1$ is divisible by 9

(vi) x^n-y^n is divisible by $x-y$

(vii) $10^n+3.4^{n+2}+5$ is divisible by 9

(viii) $\frac{n^5}{5}+\frac{n^3}{3}+\frac{7n}{15}$ is a natural number

(ix) $4+8+12+...+4n=2n(n+1)$

(x) $5^{2n}-1$ is divisible by 24

(xi) n^2+n is even natural number.

(xii) $n(n+1)(2n+1)$ is divisible by 6.

(xiii) $S_n=n^3+3n^2+5n+3$ is divisible by 3.

(xiv) 7^n-3^n is divisible by 4.

(xv) Sum of the cubes of three consecutive natural numbers is divisible by 9.

(xvi) $\frac{1}{3.7}+\frac{1}{7.11}+\frac{1}{11.15}+...+\frac{1}{(4n-1)(4n+3)}=\frac{n}{3(4n+3)}$

(xvii) $7+77+777+\underbrace{777.........7}_{n \text{ times}}=\frac{7}{81}\left(10^{n+1}-9n-10\right)$

(xviii) $a+(a+d)+(a+2d)+...+(a+(n-1)d)=\frac{n}{2}\left(2a+(n-1)d\right)$