RD Sharma Solutions Class 11 Maths Chapter 12 Ex 12.1

Mathematical Induction Ex 12.1 Q1

$P(n): n(n+1)$ is even

$P(3): 3.(3+1)$ is even

Mathematical Induction Ex 12.1 Q2

$P(n): n^3 + n$ is divisible by 3

$P(3): 3^3 + 3$ is divisible by 3

$\Rightarrow P(3): 30$ is divisible by 3.

$\therefore \quad P(3)$ is true

Now,

$P(4): 4^3 + 3 = 67$ is divisible by 3

Since, 67 is not divisible by 3

So, $P(4)$ is not true

Mathematical Induction Ex 12.1 Q3

$P(n): 2^n \geq 3n$

Given that $P(r)$ is true

$\Rightarrow \qquad 2^r \geq 3r$

Multiplying both the sides by 2,

$2.2^r \geq 2.3r$

$2^{r+1} \geq 6r$

$\geq 3r + 3r$

$\geq 3 + 3r,$ $\qquad [\text{Since } 3r \geq 3 \Rightarrow \quad 3r + 3r \geq 3 + 3r]$

$2^{r+1} \geq 3(r+1)$

$\Rightarrow \qquad P(r+1)$ is true

Mathematical Induction Ex 12.1 Q4

Here, $P(n): n^2+n$ is even

Given, $P(r)$ is true

$\Rightarrow \quad r^2+r$ is even

$\Rightarrow \quad r^2+r=2\lambda \qquad ---(1)$

Now,

$(r+1)^2+(r+1)$

$=r^2+2r+1+r+1$

$=\left(r^2+r\right)+2r+2$

$=2\lambda+2r+2 \qquad$ [Using equation (1)]

$=2(\lambda+r+1)$

$=2\mu$

$\Rightarrow \quad (r+1)^2+(r+1)$ is even

$\Rightarrow \quad P(r+1)$ is true

Mathematical Induction Ex 12.1 Q5

$P(n): 1+2+3+---+n=\dfrac{n(n+1)}{2}$ is true for all $n \in N$

Mathematical Induction Ex 12.1 Q6

$P(n): n^2 - n + 41$ is prime

$P(1): 1 - 1 + 41$ is prime

$\Rightarrow P(1): 41$ is prime

$\therefore P(1)$ is true.

$P(2): 2^2 - 2 + 41$ is prime

$\Rightarrow P(2): 43$ is prime

$\therefore P(2)$ is true.

$P(3): 3^2 - 3 + 41$ is prime

$\Rightarrow P(3): 47$ is prime

$\therefore P(3)$ is true.

$P(41): (41)^2 - 41 + 41$ is prime

$P(41): (41)^2$ is prime

$\Rightarrow \quad P(41)$ is not true