



Geometric Progressions Ex 20.4 Q 2

$$\begin{aligned}
 & 9^{\frac{1}{3}} \times 9^{\frac{1}{9}} \times 9^{\frac{1}{27}} \dots \infty \\
 &= 9^{\left(\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots\right)} \\
 &= 9^{\left(\frac{\frac{1}{3}}{1 - \frac{1}{3}}\right)} \quad \left[\text{Using } S_{\infty} = \frac{a}{1 - r}\right] \\
 &= 9^{\left(\frac{1}{3} \times \frac{3}{2}\right)} \\
 &= 9^{\frac{1}{2}} \\
 &= 3
 \end{aligned}$$

So,

$$9^{\frac{1}{3}} \times 9^{\frac{1}{9}} \times 9^{\frac{1}{27}} \dots \infty = 3$$

Geometric Progressions Ex 20.4 Q 3

$$\begin{aligned}
 & 2^{\frac{1}{4}}, 4^{\frac{1}{8}}, 8^{\frac{1}{16}}, 16^{\frac{1}{32}}, \dots, \infty \\
 &= 2^{\frac{1}{4}}, 2^{\frac{2}{8}}, 2^{\frac{3}{16}}, 2^{\frac{4}{32}}, \dots, \infty \\
 &= \left(\frac{1}{4} + \frac{2}{8} + \frac{3}{16} + \frac{4}{32} + \dots, \infty\right) \\
 &= 2 \\
 &= 2^5 \text{ ----- (1)} \\
 &S = \frac{1}{4} + \frac{2}{8} + \frac{3}{16} + \frac{4}{32} + \dots, \infty \\
 &S = \left(\frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots, \infty\right) 2 \\
 &\frac{S}{2} = \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \dots, \infty \\
 &= \frac{\frac{1}{4}}{1 - \frac{1}{2}} \\
 &= \frac{1}{4} \times \frac{2}{1} \\
 &S = \frac{1}{2} \\
 &S = 1
 \end{aligned}$$

$$\text{Thus } 2^{\frac{1}{4}}, 4^{\frac{1}{8}}, 8^{\frac{1}{16}}, 16^{\frac{1}{32}}, \dots, \infty = 2^1 = 2$$

Geometric Progressions Ex 20.4 Q4

$$S_p = 1 + r^p + r^{2p} + \dots + \infty$$

$$S_p = \frac{1}{1 - r^p}$$

$$s_p = 1 - r^p + r^{2p} + \dots + \infty$$

$$s_p = \frac{1}{1 + r^p}$$

Now,

$$\begin{aligned} S_p + s_p &= \frac{1}{1 - r^p} + \frac{1}{1 + r^p} \\ &= \frac{2}{1 - r^{2p}} \end{aligned}$$

$$S_p + s_p = 2 \times S_{2p}$$

Geometric Progressions Ex 20.4 Q5.

Here,

$$a = 4$$

$$A_3 - a_5 = \frac{31}{81}$$

$$ar^2 - ar^4 = \frac{32}{81}$$

$$r^2 4(1 - r^2) = \frac{32}{81}$$

$$r^2(1 - r^2) = \frac{8}{81}$$

Let $r^2 = A$

$$A(1 - A) = \frac{8}{81}$$

$$A - A^2 = \frac{8}{81}$$

$$81A - 81A^2 = 8$$

$$81A^2 - 81A + 8 = 0$$

$$A = \frac{81 \pm \sqrt{(81)^2 - 4 \times 81 \times 8}}{81 \times 2}$$

$$= \frac{81 \pm \sqrt{6561 - 2592}}{162}$$

$$= \frac{81 \pm \sqrt{3969}}{162}$$

$$= \frac{81 \pm 63}{162}$$

$$= \frac{81 + 63}{162} \text{ or } \frac{81 - 63}{162}$$

$$= \frac{144}{162} \text{ or } \frac{18}{162}$$

$$r^2 = \frac{8}{9} \text{ or } \frac{1}{9}$$

$$r = \pm \frac{2\sqrt{2}}{3} \text{ or } \pm \frac{1}{3}$$

Since it is a decreasing G.P.,

$$r = \frac{2\sqrt{2}}{3}, \frac{1}{3}$$

$$S_{\infty} = \frac{4}{1 - \frac{2\sqrt{2}}{3}} \text{ and } S_{\infty} = \frac{4}{1 - \frac{1}{3}}$$

$$S_{\infty} = \frac{12}{3 - 2\sqrt{2}}, 6$$

***** END *****