

Determine whether the geometric series is convergent or divergent. If it is convergent, find its sum.¹

$$4 + 3 + \frac{9}{4} + \frac{27}{16} + \dots$$

Note that

$$\begin{aligned}\frac{3}{4} &= \frac{3}{4} \\ \frac{9/4}{3} &= \frac{9}{4} \cdot \frac{1}{3} = \frac{3}{4} \\ \frac{27/16}{9/4} &= \frac{27}{16} \cdot \frac{4}{9} = \frac{3}{4}\end{aligned}$$

so the series is geometric with $r = \frac{3}{4}$ and $a_1 = 4$.

We have

$$\begin{aligned}4 + 3 + \frac{9}{4} + \frac{27}{16} + \dots &= \sum_{n=1}^{\infty} 4 \left(\frac{3}{4}\right)^{n-1} \\ &= \frac{4}{1 - \frac{3}{4}} \\ &= 16\end{aligned}$$

¹Stewart, *Calculus, Early Transcendentals*, p. 716, #18.