

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

$$\sum_{n=1}^{\infty} \frac{6 \cdot 2^{2n-1}}{3^n}$$

Note that

$$\begin{aligned} \sum_{n=1}^{\infty} \frac{6 \cdot 2^{2n-1}}{3^n} &= \sum_{n=1}^{\infty} \frac{6 \cdot 2^{2n} \cdot 2^{-1}}{3^n} \\ &= \sum_{n=1}^{\infty} \frac{6 \cdot 4^n}{2 \cdot 3^n} \\ &= 3 \cdot \sum_{n=1}^{\infty} \frac{4^n}{3^n} \\ &= 3 \cdot \sum_{n=1}^{\infty} \left(\frac{4}{3}\right)^n \end{aligned}$$

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

Since $|\frac{4}{3}| > 1$, the series is divergent.

¹Stewart, *Calculus, Early Transcendentals*, p. 716, #26.