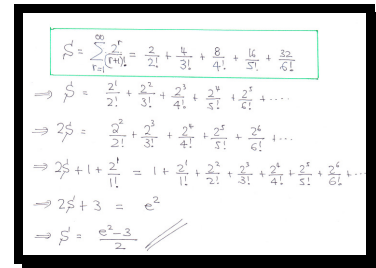


Question

By showing a detailed method, sum the following series.

$$\sum_{r=1}^{\infty} \left[\frac{2^r}{(r+1)!} \right]$$

$$\boxed{\frac{1}{2}(e^2 - 3)}$$



Handwritten solution for the sum of the series:

$$S = \sum_{r=1}^{\infty} \frac{2^r}{(r+1)!} = \frac{2}{2!} + \frac{4}{3!} + \frac{8}{4!} + \frac{16}{5!} + \frac{32}{6!} + \dots$$

$$\Rightarrow S = \frac{2^1}{2!} + \frac{2^2}{3!} + \frac{2^3}{4!} + \frac{2^4}{5!} + \frac{2^5}{6!} + \dots$$

$$\Rightarrow 2S = \frac{2^2}{2!} + \frac{2^3}{3!} + \frac{2^4}{4!} + \frac{2^5}{5!} + \frac{2^6}{6!} + \dots$$

$$\Rightarrow 2S + 1 = 1 + \frac{2^1}{1!} + \frac{2^2}{2!} + \frac{2^3}{3!} + \frac{2^4}{4!} + \frac{2^5}{5!} + \frac{2^6}{6!} + \dots$$

$$\Rightarrow 2S + 1 = e^2$$

$$\Rightarrow S = \frac{e^2 - 3}{2}$$