

### Exercise 3

Find the closed form function for the following Taylor series:

$$f(x) = x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \frac{1}{4!}x^4 + \dots$$

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#### Solution

$$f(x) = x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \frac{1}{4!}x^4 + \dots$$

$$f(x) = \frac{1}{1!}x^1 + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \frac{1}{4!}x^4 + \dots$$

$$f(x) = \sum_{n=1}^{\infty} \frac{x^n}{n!}$$

$$f(x) = \sum_{n=0}^{\infty} \frac{x^n}{n!} - 1$$

Therefore,

$$f(x) = e^x - 1.$$