

Calculus II, Section 11.10, #40
Taylor and Maclaurin Series

Use the a Maclaurin series to obtain the Maclaurin series for the given function.¹

$$f(x) = x^2 \ln(1 + x^3)$$

We know

$$\ln(1 + x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n}$$

so

$$\begin{aligned} \ln(1 + x^3) &= \sum_{n=1}^{\infty} (-1)^{n-1} \frac{(x^3)^n}{n} \\ &= \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^{3n}}{n} \end{aligned}$$

and

$$x^2 \cdot \ln(1 + x^3) = x^2 \cdot \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^{3n}}{n}$$

Thus,

$$f(x) = \sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^{3n+2}}{n}$$

¹Stewart, *Calculus, Early Transcendentals*, p. 771, #40.