

Calculus BC: Practice (Constructing Maclaurin Series)

Using the Maclaurin Table as building blocks, find the first 4 terms of the Maclaurin Series for each of the following:

$$1. \quad \cos(2x) = 1 - \frac{(2x)^2}{2!} + \frac{(2x)^4}{4!} - \frac{(2x)^6}{6!}$$

$$= 1 - \frac{4x^2}{2} + \frac{16x^4}{24} - \frac{64x^6}{720} = 1 - 2x^2 + \frac{2}{3}x^4 - \frac{4}{45}x^6$$

$$2. \quad xe^x = x \left( 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} \right) = x + x^2 + \frac{x^3}{2!} + \frac{x^4}{3!}$$

$$3. \quad \sin(x^2) = x - \frac{(x^2)^3}{3!} + \frac{(x^2)^5}{5!} - \frac{(x^2)^7}{7!}$$

$$= x - \frac{x^6}{3!} + \frac{x^{10}}{5!} - \frac{x^{14}}{7!}$$

$$4. \quad x \cos x = x \left( 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} \right)$$

$$= x - \frac{x^3}{2!} + \frac{x^5}{4!} - \frac{x^7}{6!}$$

$$5. \quad x^2 \ln(1+x) = x^2 \left( x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} \right)$$

$$= x^3 - \frac{x^4}{2} + \frac{x^5}{3} - \frac{x^6}{4}$$

Recall  $\frac{1}{1+x} = 1 - x + x^2 - x^3$

$\ln(1+x) = x - \frac{1}{2}x^2 + \frac{1}{3}x^3 - \frac{1}{4}x^4$