

## Calculus III

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Recall the following:

- (1)  $e^x = 1 + \sum_{n=1}^{\infty} \frac{x^n}{n!} \quad \forall x \in \mathbb{R}$
- (2)  $\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!} \quad \forall x \in \mathbb{R}$
- (3)  $\arctan x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)} \quad \forall x \in [-1, 1]$
- (4)  $\ln(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1} x^n}{n} \quad \forall x \in (-1, 1]$
- (5)  $\sinh x = \sum_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!} \quad \forall x \in \mathbb{R}$
- (6)  $\frac{1}{1-x} = 1 + \sum_{n=1}^{\infty} x^n \quad \forall x \in (-1, 1)$
- (7)  $\cos x = 1 + \sum_{n=1}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!} \quad \forall x \in \mathbb{R}$
- (8)  $\cosh x = 1 + \sum_{n=1}^{\infty} \frac{x^{2n}}{(2n)!} \quad \forall x \in \mathbb{R}$
- (9)  $\frac{1}{1+x^2} = 1 + \sum_{n=1}^{\infty} (-1)^n \cdot x^{2n} \quad \forall x \in (-1, 1)$

Replacement problem 39. Consider

$$f : \mathbb{R} \longrightarrow \mathbb{R} \ni f(x) = \sin x$$

Find the degree of a Maclaurin polynomial so that  $\sin(0.3)$  is approximated with 3 decimal place accuracy.

Replacement problem 40. Consider

$$f : \mathbb{R} \longrightarrow \mathbb{R} \ni f(x) = \cos x$$

Find the degree of a Maclaurin polynomial so that  $\cos\left(\frac{\pi}{3}\right)$  is approximated with 3 decimal place accuracy.

Replacement problem 41. Consider

$$f : \mathbb{R} \longrightarrow \mathbb{R} \ni f(x) = \frac{1}{1+x^2}$$

Find the degree of a Maclaurin polynomial so that  $f\left(\sqrt[5]{3}\right)$  is approximated with 3 decimal place accuracy.