

Match the Maclaurin Series, the function, & the expansion

$$\sin(x) \quad x - \frac{x^3}{6} + \frac{x^5}{120} - \dots \quad \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k+1}}{(2k+1)!}$$

$$\cos(x) \quad 1 - \frac{x^2}{2} + \frac{x^4}{24} - \frac{x^6}{720} + \dots \quad \sum_{k=0}^{\infty} (-1)^k \frac{x^{2k}}{(2k)!}$$

$$e^x \quad 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} + \dots \quad \sum_{k=0}^{\infty} \frac{x^k}{k!}$$

$$\frac{1}{1-x} \quad 1 + x + x^2 + x^3 + \dots \quad \sum_{k=0}^{\infty} x^k$$

$$\frac{1}{1-2x} \quad 1 + 2x + 4x^2 + 8x^3 + \dots \quad \sum_{k=0}^{\infty} 2^k x^k$$

$$\frac{1}{(1-x)^2} \quad 1 + 2x + 3x^2 + 4x^3 + \dots \quad \sum_{k=1}^{\infty} kx^{k-1}$$

$$\ln(1-x) \quad x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} - \dots \quad \sum_{k=1}^{\infty} \frac{x^k}{k}$$

Demo

$\sin(x)$

Taylor Series

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

shifted to the right by a .

Examples • e^x at $x=1$

• x^4 at $x=2$

Riemann Sums

$$\int_a^b f(x) dx \approx \sum_{k=1}^n f\left(k\left(\frac{b-a}{n}\right)\right) \frac{b-a}{n} \quad \text{Right R. Sum}$$
$$\approx \sum_{k=1}^n f\left((k-1)\left(\frac{b-a}{n}\right)\right) \frac{b-a}{n} \quad \text{Left R. Sum}$$

Approx • Area under $y=x$ from 0 to 4

• Area under $\cos(x)$ for 0 to 2π

• Area under $y=x^2$ from 5 to 9