

## Taylor expansion of some functions (19.07.2022)

Expansion	Domain
1. $(1 - x)^{-1} = 1 + x + x^2 + x^3 + x^4 + \dots$	$-1 < x < 1$
2. $(1 + x)^{-1} = 1 - x + x^2 - x^3 + x^4 - \dots$	$-1 < x < 1$
3. $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$	$-\infty < x < \infty$
4. $a^x = e^{x \ln a} = 1 + x \ln a + \frac{(x \ln a)^2}{2!} + \frac{(x \ln a)^3}{3!} + \dots$	$-\infty < x < \infty$
5. $\ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$	$-1 < x \leq 1$
6. $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$	$-\infty < x < \infty$
7. $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$	$-\infty < x < \infty$
8. $\operatorname{tg} x = x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + \dots$	$ x  < \frac{\pi}{2}$
9. $\arcsin x = x + \frac{1}{2} \frac{x^3}{3} + \frac{1 \cdot 3}{2 \cdot 4} \frac{x^5}{5} + \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6} \frac{x^7}{7} + \dots$	$ x  < 1$
10. $\arccos x = \frac{\pi}{2} - \arcsin x = \frac{\pi}{2} - \left( x + \frac{1}{2} \frac{x^3}{3} + \frac{1 \cdot 3}{2 \cdot 4} \frac{x^5}{5} + \dots \right)$	$ x  < 1$
11. $\operatorname{arctg} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots$	$ x  < 1$
12. $\operatorname{arctg} x = \pm \frac{\pi}{2} - \frac{1}{x} + \frac{1}{3x^3} - \frac{1}{5x^5} + \dots$	$+ \text{ for } x \geq 1; - \text{ for } x \leq -1$
13. $\sinh x = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \dots$	$-\infty < x < \infty$
14. $\cosh x = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \dots$	$-\infty < x < \infty$