

Taylor's Formula $T_2(x)$

$$f(x) = \underbrace{f(a) + f'(a)(x-a)}_{T_1(x)} + \underbrace{\frac{f''(a)}{2}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \dots + \frac{f^{(n)}(a)}{n!}(x-a)^n}_{T_2(x)} + \boxed{\frac{f^{(n+1)}(z)}{(n+1)!}(x-a)^{n+1}}_{R_n(x)}$$

Maclaurin Series

$$1. e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots, \quad -\infty < x < \infty$$

$$2. \sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots, \quad -\infty < x < \infty$$

$$3. \cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots, \quad -\infty < x < \infty$$

$$4. \frac{1}{1-x} = 1 + x + x^2 + x^3 + \dots, \quad -1 < x < 1$$

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

$$6. \arctan(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \dots, \quad -1 < x < 1$$

Summation Formulae

$$7. \sum_{i=1}^n c = cn$$

$$8. \sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$9. \sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$10. \sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}$$

Inverse Trigonometric Functions

$$11. \frac{d}{dx}(\arcsin x) = \frac{1}{\sqrt{1-x^2}}$$

$$14. \frac{d}{dx}(\operatorname{arcsec} x) = \frac{1}{x\sqrt{x^2-1}}$$

$$17. \int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\left(\frac{x}{a}\right) + C$$

$$12. \frac{d}{dx}(\arccos x) = \frac{-1}{\sqrt{1-x^2}}$$

$$15. \frac{d}{dx}(\operatorname{arccsc} x) = \frac{-1}{x\sqrt{x^2-1}}$$

$$18. \int \frac{dx}{a^2+x^2} = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$$

$$13. \frac{d}{dx}(\arctan x) = \frac{1}{1+x^2}$$

$$16. \frac{d}{dx}(\operatorname{arccot} x) = \frac{-1}{1+x^2}$$

$$19. \int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a} \operatorname{arcsec}\left(\frac{x}{a}\right) + C$$

Particular Trigonometric Integrals

$$20. \int \sec x \, dx = \ln|\sec x + \tan x| + C$$

$$21. \int \csc x \, dx = \ln|\csc x - \cot x| + C$$

Error Bounds for Approximate Integration

$$22. \text{Midpoint Rule: } |E_{M_n}| \leq \frac{K(b-a)^3}{24n^2} \text{ where } |f''(x)| \leq K \text{ on } [a, b]$$

$$23. \text{Trapezoid Rule: } |E_{T_n}| \leq \frac{K(b-a)^3}{12n^2} \text{ where } |f''(x)| \leq K \text{ on } [a, b]$$

$$24. \text{Simpson's Rule: } |E_{S_n}| \leq \frac{K(b-a)^5}{180n^4} \text{ where } |f^{(4)}(x)| \leq K \text{ on } [a, b]$$

Trigonometric Identities

$$25. \sin^2 x + \cos^2 x = 1$$

$$28. \sin^2 x = \frac{1 - \cos(2x)}{2}$$

$$30. \sin(2x) = 2 \sin x \cos x$$

$$26. 1 + \tan^2 x = \sec^2 x$$

$$29. \cos^2 x = \frac{1 + \cos(2x)}{2}$$

$$31. \cos(2x) = \cos^2 x - \sin^2 x$$

$$27. 1 + \cot^2 x = \csc^2 x$$