

AMAT 219

Integrals

$$1. \int \cot(x) dx = \ln|\sin(x)| + C$$

$$2. \int \sec(x) dx = \ln|\sec(x) + \tan(x)| + C$$

$$3. \int \csc(x) dx = \ln|\csc(x) - \cot(x)| + C$$

$$4. \int \sec^2(x) dx = \tan(x) + C$$

$$5. \int \csc^2(x) dx = -\cot(x) + C$$

$$6. \int \sec(x) \tan(x) dx = \sec(x) + C$$

$$7. \int \csc(x) \cot(x) dx = -\csc(x) + C$$

$$8. \int \frac{1}{\sqrt{1-x^2}} dx = \arcsin(x) + C$$

$$9. \int \frac{1}{x^2+1} dx = \arctan(x) + C$$

$$10. \int \frac{1}{x\sqrt{x^2-1}} dx = \operatorname{arcsec}(x) + C$$

Basic Trigonometric Identities

$$(i) \cos^2(\theta) + \sin^2(\theta) = 1 \quad (ii) 1 + \tan^2(\theta) = \sec^2(\theta) \quad (iii) \cot^2(\theta) + 1 = \csc^2(\theta)$$

$$(i) \sin(2\theta) = 2 \sin(\theta) \cos(\theta) \quad (ii) \cos(2\theta) = 2 \cos^2(\theta) - 1 = 1 - 2 \sin^2(\theta)$$

$$(iii) \cos^2(\theta) = \frac{1}{2}[1 + \cos(2\theta)] \quad (iv) \sin^2(\theta) = \frac{1}{2}[1 - \cos(2\theta)]$$

Approximations to $\int_a^b f(x) dx$

$$\text{Trapezoid Rule: } T_n = h\left(\frac{1}{2}f(x_0) + f(x_1) + \dots + f(x_{n-1}) + \frac{1}{2}f(x_n)\right)$$

$$\text{Midpoint Rule: } M_n = h\left(\sum_{k=1}^n f(m_k)\right)$$

$$\text{Simpson's Rule: } S_n = h/3[f(x_0) + f(x_n) + 4(\sum_{\text{odds}} f(x)) + 2(\sum_{\text{evens}} f(x))]$$

$$\text{where } h = (b - a)/n = |x_k - x_{k-1}|$$