Integration Strategy

Calculus II

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Relevant Trig Identities

Memorize these:

- $\sin\theta := \frac{OPP}{HYP}, \cos\theta := \frac{ADJ}{HYP}, \tan\theta := \frac{OPP}{ADJ}$
- $\csc\theta := \frac{HYP}{OPP}, \sec\theta := \frac{HYP}{ADJ}, \cot\theta := \frac{ADJ}{OPP}$
- $\csc\theta = \frac{1}{\sin\theta}, \sec\theta = \frac{1}{\cos\theta}, \cot\theta = \frac{1}{\tan\theta}$
- $\tan\theta = \frac{\sin\theta}{\cos\theta}, \cot\theta = \frac{\cos\theta}{\sin\theta}$
- $\sin^2\theta + \cos^2\theta = 1, \tan^2\theta + 1 = \sec^2\theta, 1 + \cot^2\theta = \csc^2\theta$
- $\sin(-\theta) = -\sin\theta, \cos(-\theta) = \cos\theta$
- $\sin(A+B) = \sin A\cos B + \cos A\sin B$
- $\cos(A+B) = \cos A\cos B - \sin A\sin B$
- $\sin(A-B) = \sin A\cos B - \cos A\sin B$
- $\cos(A-B) = \cos A\cos B + \sin A\sin B$
- $\sin(2\theta) = 2\sin\theta\cos\theta$
- $\cos^2\theta = \frac{1+\cos(2\theta)}{2}, \sin^2\theta = \frac{1-\cos(2\theta)}{2}$

Basic Integral Rules

Memorize these:

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C \qquad \int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^x\,dx = e^x + C \qquad \int a^x\,dx = \frac{a^x}{\ln a} + C$$

$$\int \sin x\,dx = -\cos x + C \qquad \int \cos x\,dx = \sin x + C$$

$$\int \sec^2 x\,dx = \tan x + C \qquad \int \csc^2 x\,dx = -\cot x + C$$

$$\int \sec x \tan x\,dx = \sec x + C \qquad \int \csc x \cot x\,dx = -\csc x + C$$

$$\int \tan x\,dx = \ln|\sec x| + C \qquad \int \cot x\,dx = \ln|\sin x| + C$$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C \qquad \int \csc x\,dx = -\ln|\csc x + \cot x|$$

Integration Toolbox

- Algebraic Simplification
- Factoring
- Binomial Theorem/Pascal's Triangle
- Rationalizing the Numerator (RN)
- Rationalizing the Denominator (RD)
- Clever insertion of one (CI-1)
- Clever insertion of zero (CI-0)
- Split Fraction (SF)
- Trig Identities (TRG)
- Reference Triangles
- Basic Integral Rules
- Change of Variables (CV)
- Integration by Parts (IBP)
- Partial Fraction Decomposition (PFD)
- Completing the Square (CS)
- Forms involving powers of trig functions
- Forms involving $\sqrt{a^2 - u^2}$, $\sqrt{a^2 + u^2}$, or $\sqrt{u^2 - a^2}$

Fin

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