Session 8: Integration Practice (Solutions)

November 8, 2024

Evaluate the following indefinite integrals:

Trigonometric Functions

1. $\int \sin(3x)\cos(3x)\,dx = \frac{1}{6}\sin^2(3x) + C$
2. $\int \sec^2(x)\tan^3(x)\,dx = \frac{1}{4}\tan^4(x) + C$
3. $\int \frac{1}{1+\cos(x)}\,dx = \tan(\frac{x}{2}) + C$
4. $\int \sin^4(x)\,dx = \frac{3}{8}x - \frac{1}{4}\sin(2x) + \frac{1}{32}\sin(4x) + C$
5. $\int \frac{\cos(2x)}{\sin^2(2x)}\,dx = -\frac{1}{2}\csc(2x) + C$

Exponential Functions

1. $\int xe^{x^2}\,dx = \frac{1}{2}e^{x^2} + C$
2. $\int e^x\sqrt{1+e^x}\,dx = \frac{2}{3}(1+e^x)^{3/2} + C$
3. $\int \frac{e^{2x}}{1+e^{4x}}\,dx = \frac{1}{2}\arctan(e^{2x}) + C$
4. $\int e^{\sin(x)}\cos(x)\,dx = e^{\sin(x)} + C$
5. $\int (e^x + e^{-x})^2\,dx = \int (e^{2x} + 2 + e^{-2x})\,dx = \frac{1}{2}e^{2x} + 2x - \frac{1}{2}e^{-2x} + C$

Logarithmic Functions

1. $\int \frac{1}{x\ln(x)}\,dx = \ln|\ln(x)| + C$
2. $\int \frac{\ln(x)^2}{x}\,dx = \frac{1}{3}\ln(x)^3 + C$
3. $\int \frac{1}{x(1+\ln(x)^2)}\,dx = \arctan(\ln(x)) + C$
4. $\int \tan(x)\ln(\cos(x))\,dx = -\frac{1}{2}\ln(\cos(x))^2 + C$
5. $\int \frac{\sin(\ln(x))}{x}\,dx = -\cos(\ln(x)) + C$