Section 12.3, Integrals Involving Exponential and Logarithmic Functions

1 Exponential Functions

Since $\frac{d}{dx}e^x = e^x$, $\int e^x\,dx = e^x + C$ and $\int e^{u(x)}u'(x)\,dx = \int e^u\,du = e^{u(x)} + C$.

Examples

1. $\int 2e^{2x}\,dx = e^{2x} + C$

2. $\int e^{4x}\,dx = \frac{1}{4}e^{4x} + C$

3. $\int 7xe^{0.1x^2}\,dx = \frac{7}{0.2}e^{0.1x^2} + C = 35e^{0.1x^2} + C$

4. $\int \frac{4}{e^{4x-3}}\,dx = \int 4e^{3-4x}\,dx = -e^{3-4x} + C$

2 Logarithmic Functions

Since $\frac{d}{dx}\ln x = \frac{1}{x}$, $\int \frac{1}{x}\,dx = \ln|x| + C$ and $\int \frac{u'(x)}{u(x)}\,dx = \int \frac{1}{u}\,du = \ln|u(x)| + C$.

Examples

1. $\int \frac{1}{x+1}\,dx = \ln|x+1| + C$

2. $\int \frac{x}{x^2-3}\,dx = \frac{1}{2}\ln|x^2-3| + C$

3. $\int \frac{2x^3-1}{x^4-2x}\,dx = \frac{1}{2}\ln|x^4-2x| + C$

4. We also worked on #47 in class.