Natural Logarithms - Differentiation and Integration

Derivative of the Natural Logarithmic Function

$$\frac{d}{dx}\ln x = \frac{1}{x} \quad x > 0$$

$$\frac{d}{dx}\ln u = \frac{1}{u} \bullet \frac{du}{dx} \quad u > 0$$

1. Find the derivative of each.

a) $\ln 2x$

b) $\ln\left(x^2 + 3\right)$

c) $\ln\left(\ln x\right)$

d) $\ln\dfrac{1}{x\sqrt{x+1}}$

e) $y = \dfrac{\left(x^2+1\right)\sqrt{x+3}}{x-1}$

Integrating the Natural Logarithmic Function

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

2. Integrate.

a) $\int \frac{2}{x}\,dx$

b) $\int \frac{1}{4x-1}\,dx$

c) $\int_0^2 \frac{2x}{x^2-5}\,dx$

d) $\int \frac{x^2+x+1}{x^2+1}\,dx$

e) $\int_{-\pi/2}^{\pi/2} \frac{4\cos\theta}{3+2\sin\theta}\, d\theta$