

## Derivatives of Natural Logs

Find the derivatives of the following:

1.  $y = 4 \ln x$

2.  $y = \ln 2x$

3.  $y = \ln(x^3)$

4.  $y = (\ln x)^2$

5.  $y = \ln(\sin x)$

6.  $y = \ln(2 + \sqrt{x})$

7.  $y = \ln\left(\frac{x}{1+x^2}\right)$

8.  $y = \ln(\ln x)$

9.  $y = x^3 \ln x$

10.  $y = \sqrt{\ln x}$

11.  $y = \sin\left(\frac{5}{\ln x}\right)$

12.  $y = \sqrt{1 + \ln^2 x}$

13.  $y = x^3 \ln(3 - 2x)$

14.  $y = x[\ln(x^2 - 2x)]^3$

15.  $y = (x^2 + 1)[\ln(x^2 + 1)]^2$

16.  $y = \frac{\ln x}{1 + \ln x}$

17.  $y = \frac{x^2}{1 + \ln x}$

18.  $y = \ln\left(\frac{x^2 \sin x}{\sqrt{1+x}}\right)$

## Integrals of Natural Logs

1.  $\int \frac{dx}{2x}$

2.  $\int \frac{5x^4}{x^5+1} dx$

3.  $\int \frac{x^2}{x^3-4} dx$

4.  $\int \frac{t+1}{t} dt$

5.  $\int \frac{dx}{x \ln x}$

6.  $\int \frac{1}{x} \cos(\ln x) dx$

7.  $\int \frac{1}{x} (\ln x)^3 dx$

8.  $\int \frac{dx}{\sqrt{x}(1-2\sqrt{x})}$

9.  $\int_0^1 \frac{1}{3x+2} dx$

10.  $\int_1^4 \frac{3}{1-2x} dx$

11.  $\int_{-1}^0 \frac{x}{x^2+5} dx$

12.  $\int_1^4 \frac{1}{\sqrt{x}(1+\sqrt{x})} dx$

13.  $\int_e^{e^2} \frac{dx}{x \ln x}$

14.  $\int_2^{16} \frac{dx}{2x\sqrt{\ln x}}$

**Deriv. of Ln KEY**

1.  $\frac{4}{x}$

2.  $\frac{1}{x}$

3.  $\frac{3}{x}$

4.  $\frac{2(\ln x)}{x}$

5.  $\cot x$

6.  $\frac{1}{2\sqrt{x}(2+\sqrt{x})} = \frac{1}{4\sqrt{x}+2x}$

7.  $\frac{1-x^2}{x(1+x^2)}$

8.  $\frac{1}{x \ln x}$

9.  $3x^2 \ln x + x^2$

10.  $\frac{1}{2x\sqrt{\ln x}}$

11.  $-5 \cos\left(\frac{5}{\ln x}\right) \cdot \frac{1}{x(\ln x)^2}$

12.  $\frac{\ln x}{x\sqrt{1+\ln^2 x}}$

13.  $3x^2 \ln(3-2x) - \frac{2x^3}{3-2x}$

14.  $\left[\ln(x^2-2x)\right]^3 + \frac{(6x-6)\left[\ln(x^2-2x)\right]^2}{(x-2)}$

15.  $2x\left[\ln(x^2+1)\right]^2 + 4x\left[\ln(x^2+1)\right]$

16.  $\frac{1}{x(1+\ln x)^2}$

17.  $\frac{x+2x \ln x}{(1+\ln x)^2}$

18.  $\frac{2}{x} + \cot x - \frac{1}{2(1+x)}$

**Integrals of 1/x: KEY**

1.  $\frac{1}{2} \ln|x| + C$

2.  $\ln|x^5+1| + C$

3.  $\frac{1}{3} \ln|x^3-4| + C$

4.  $t + \ln|t| + C$

5.  $\ln(\ln|x|) + C$

6.  $\sin(\ln|x|) + C$

7.  $\frac{(\ln x)^4}{4} + C$

8.  $-\ln|1-2\sqrt{x}| + C$

9.  $\frac{1}{3}[\ln 5 - \ln 2] \approx .3054$

10.  $-\frac{3}{2} \ln 7 \approx -2.9189$

11.  $\frac{1}{2}[\ln 5 - \ln 6] \approx -.0912$

12.  $2[\ln 3 - \ln 2] \approx .8109$

13.  $\ln 2 \approx .6931$

14.  $\sqrt{\ln 16} - \sqrt{\ln 2} \approx .8326$