

log base is 10

ln base is e

## 5.4 Natural Logarithms

1) Use the properties of natural logarithms to write each expression in expanded form

a)  $\ln 7xy$

$$\ln 7 + \ln x + \ln y$$

b)  $\ln \frac{2x}{y}$

$$\ln 2 + \ln x - \ln y$$

c)  $\ln x^2yz$

$$2\ln x + \ln y + \ln z$$

d)  $\ln x^3y^5$

$$3\ln x + 5\ln y$$

e)  $\ln 4x^2$

$$\ln 4 + 2\ln x$$

2) Use the properties of natural logarithms to write each expression in simplified form.

a)  $5\ln x - \ln 2$

$$\ln x^5 - \ln 2$$

$$\ln \frac{x^5}{2}$$

b)  $8\ln x - 2\ln y$

$$\ln x^8 - \ln y^2$$

$$\ln \frac{x^8}{y^2}$$

c)  $\ln 7 - a\ln x$

$$\ln 7 - \ln x^a$$

$$\ln \frac{7}{x^a}$$

d)  $\ln 3 + \ln y - 4\ln x$

$$\ln 3y - 4\ln x$$

$$\ln 3y - \ln x^4$$

$$\ln \frac{3y}{x^4}$$