

Name: _____

Natural Exponential & Logarithmic Functions

Exercise 1: Expand each logarithm

1) $\ln\left[(x+5)^2(x^2+1)^3\right]$

2) $\ln\left[(x-4)^3(x^3-3)^2\right]$

3) $\ln\left(\frac{e^x}{2x}\right)$

4) $\ln\left(\frac{3x^2(x-4)^3}{(x+1)^4}\right)$

5) $\ln\sqrt{\frac{x}{yz}}$

6) $\ln\left(\frac{1}{xy}\right)$

7) $\ln\left(\frac{x^3z^2}{y^4}\right)$

8) $\ln(xy)$

Exercise 2: Evaluate the function at the indicated value of x. Round your result to three decimal places.

| Function | Value |
|---------------------------|-------------------|
| 1) $h(x) = e^{-x}$ | $x = 20$ |
| 2) $f(x) = e^x$ | $x = \frac{3}{4}$ |
| 3) $f(x) = 2e^{-5x}$ | $x = 3.2$ |
| 4) $f(x) = 1.5e^{x/2}$ | $x = 10$ |
| 5) $f(x) = 5000e^{0.06x}$ | $x = 240$ |
| 6) $f(x) = 250e^{0.05x}$ | $x = 6$ |

Exercise 3: Write each of the following as the natural logarithm of a single simplified expression. Your answer must be in the form $\ln\Box$, where \Box is the simplified expression.

1) $\ln 3 + \ln 4 + \ln 5$

2) $\ln 12 - \ln 3 - \ln 2$

3) $\ln p + \ln q - \ln r - \ln s$

4) $\frac{1}{2}\ln a + 4\ln b - 3\ln c$

5) $2\ln 3 + 3\ln 2$