

Show all work and circle/box your final answer. All answers must be simplified unless stated otherwise.

1. Simplify the following expressions:

(a) $\ln \frac{1}{e}$

(b) $e^{2\ln x}$

2. Use the properties of logarithms to write the expression as a sum, difference, or product of simpler logarithms.

(a) $\ln \frac{9\sqrt[3]{5}}{\sqrt[4]{3}}$

(b) $\ln \left(\frac{xy}{x+y} \right)$

3. Solve the following equations (remember to check the validity of your solutions)

(a) $\ln x + \ln(3x) = 1.$

(c) $e^{\sqrt{x}} = 4$

(b) $\ln(x) + \ln(x+1) = \ln(6)$

(d) $e^{x^2-2x} = e^8$