

GSE PreCalculus – Unit – Natural Logarithms**WS: Condensing and Expanding Logs**

Name: _____

Per: _____

Date: _____

Expand the following expressions:

1. $\ln(3x)$

2. $\ln(9x)$

3. $\ln(x^3\sqrt{x-1})$

4. $\ln 3x^{\frac{2}{3}}y^5$

5. $\ln x^5$

6. $\ln \frac{2\sqrt{x}}{y^3}$

7. $\ln\left(\frac{6}{x}\right)$

8. $\ln(x^4\sqrt{x+1})$

9. $\ln \frac{x^2}{yz^3}$

Condense the following expressions:

1. $\ln 3 + \ln x - \ln y - 2\ln z$

2. $\ln 5 + \frac{1}{2}\ln x + 2\ln z$

3. $\ln 4 + 3\ln x - 5\ln y$

4. $\ln 9 + \frac{1}{2}\ln k + 2\ln p$

5. $\ln a - 2\ln b - 3\ln c$

6. $\ln x + 2\ln y + 3\ln z - \ln 5$