Logarithmic Properties

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

Let b > 0, $b \neq 0$ and let v and w be positive real numbers. Let k be a real number.

0.
$$\log_b(b^x) = x$$
 $b^{\log_b(x)} = x$

1.
$$\log_b(vw) = \log_b(v) + \log_b(w)$$

2.
$$\log_b\left(\frac{v}{w}\right) = \log_b(v) - \log_b(w)$$

3.
$$\log_b(v^k) = k \log_b(v)$$

4.
$$\log_b(x) = \frac{\log(x)}{\log(b)}$$
 $\log_b(x) = \frac{\ln(x)}{\ln(b)}$

1. Write the expressions as a single logarithm: $\ln(x) - \ln(y) + 3\ln(z)$

$$\frac{1}{3}\log(2x+1) - 2\log(x^4 - x^2 - 1)$$

2. Expand the expressions:

$$\log_2(2xy^3)$$

$$\log\left(\frac{a\sqrt{c}}{b^4}\right)$$

3. Given
$$\ln(x) = 5$$
 and $\ln(y) = 7.5$, find $\ln\left(\frac{x^2}{y}\right)$.

4. Find all x that satisfy:

(a)
$$2000e^{.05x} = 10,000$$

(b)
$$\log(x - 16) = 2 - \log(x - 1)$$

(c)
$$\log(x+1) + \log(x-1) = \log 1$$

(d)
$$\frac{10}{1+e^{-x}} = 2$$

(e)
$$7^{\frac{x}{3}\ln 5} = 9$$

(f) $\log_2(\log_3(x)) = 4$