

**Problems Set #1:**

Problems	Answers
Write each expression as a sum and/or difference of logs. $\log_3 \frac{x}{9}$	$\log_3 x - 2$
Write each expression as a sum and/or difference of logs. $\log_7 x^5$	$5 \log_7 x$
Write each expression as a sum and/or difference of logs. $\ln\left(\frac{e}{x}\right)$	$1 - \ln(x)$

**Problems Set #2:**

Problems	Answers
Write each expression as a sum and/or difference of logs. $\log_2 \frac{a}{b^2} \quad a > 0, b > 0$	$\log_2 a - 2\log_2 b$
Write each expression as a sum and/or difference of logs. $\ln\left(x\sqrt{1+x^2}\right) \quad x > 0$	$\ln(x) + \frac{1}{2}\ln(1+x)$
Write each expression as a sum and/or difference of logs. $\log_5 \left(\frac{\sqrt[3]{x^2+1}}{x^2-1}\right) \quad x > 1$	$\frac{1}{3}\log_5(x^2+1) - \log_5(x+1) - \log_5(x-1)$

**Problems Set #3:**

Problems	Answers
Write each expression as a sum and/or difference of logs. $\ln\left[\frac{(x-4)^2}{x^2-1}\right]^{2/3} \quad x > 4$	$\frac{4}{3}\ln(x-4) - \frac{2}{3}\ln(x+1) - \frac{2}{3}\ln(x-1)$
Write each expression as a single logarithm. $2\log_3 u - \log_3 v$	$\log_3\left(\frac{u^2}{v}\right)$
Write each expression as a single logarithm. $\log_2\left(\frac{1}{x}\right) + \log_2\left(\frac{1}{x^2}\right)$	$\log_2\left(\frac{1}{x^3}\right)$

**Problems Set #4:**

<b>Problems</b>	<b>Answers</b>
Write each expression as a single logarithm. $\log(x^2 + 3x + 2) - 2\log(x + 1)$	$\log\left(\frac{x + 2}{x + 1}\right)$
Write each expression as a single logarithm. $21 \log_3(\sqrt[3]{x}) + \log_3(9x^2) - \log_3 9$	$\log_3(x^9)$
Write each expression as a single logarithm. $3 \log_5(3x + 1) - 2 \log_5(2x - 1) - \log_5 x$	$\log_5 \left[ \frac{(3x + 1)^3}{x(2x - 1)^2} \right]$
Write each expression as a single logarithm. $\frac{1}{3} \log(x^3 + 1) + \frac{1}{2} \log(x^2 + 1)$	$\log\left(\sqrt[3]{x^3 + 1} \sqrt{x^2 + 1}\right)$

**Problems Set #1:**

Problems	Answer
Write each expression as a sum and/or difference of logs. $\log_3 \frac{x}{9}$	
Write each expression as a sum and/or difference of logs. $\log_7 x^5$	
Write each expression as a sum and/or difference of logs. $\ln \left( \frac{e}{x} \right)$	

**Problems Set #2:**

Problems	Answer
Write each expression as a sum and/or difference of logs. $\log_2 \frac{a}{b^2} \quad a > 0, b > 0$	
Write each expression as a sum and/or difference of logs. $\ln \left( x\sqrt{1+x^2} \right) \quad x > 0$	
Write each expression as a sum and/or difference of logs. $\log_5 \left( \frac{\sqrt[3]{x^2+1}}{x^2-1} \right) \quad x > 1$	

**Problems Set #3:**

Problems	Answer
Write each expression as a sum and/or difference of logs. $\ln \left[ \frac{(x-4)^2}{x^2-1} \right]^{2/3} \quad x > 4$	
Write each expression as a single logarithm. $2\log_3 u - \log_3 v$	
Write each expression as a single logarithm. $\log_2 \left( \frac{1}{x} \right) + \log_2 \left( \frac{1}{x^2} \right)$	

**Problems Set #4:**

Problems	Answer
Write each expression as a single logarithm. $\log(x^2 + 3x + 2) - 2\log(x + 1)$	
Write each expression as a single logarithm. $21 \log_3(\sqrt[3]{x}) + \log_3(9x^2) - \log_3 9$	
Write each expression as a single logarithm. $3 \log_5(3x + 1) - 2 \log_5(2x - 1) - \log_5 x$	
Write each expression as a single logarithm. $\frac{1}{3} \log(x^3 + 1) + \frac{1}{2} \log(x^2 + 1)$	

Directions:

With your team, you will complete each problem. (Simplify where needed). Once you are confident about your answers, raise your hand and the teacher will come check your answers. You must be confident about your answers because there are no “redos” after getting feedback. You will be scored based on your answers, using the following point system:

- 3 pts – for each problem 100% correct
- 2 pts – if the problem is correct but not in simplest form
- 1 pt – for attempting but incorrect solution

You will then be given a new problem set and the process will start again. If you have the most points at the end, you win!