

Question #37915, Math, Algebra

Condense to a single log expression:

$$[1 - 5\log 3x]/2$$

Solution

1. We can write the equality using the power rule

$$5x \log 3 = \log 3^{5x}.$$

Since $\log 10 = 1$ by using the above equality and the quotient rule the difference can be rewritten as

$$1 - 5 \log 3x = \log \frac{10}{3^{5x}}.$$

Hence the expression is condensed to a single logarithm by using the power rule and converting the rational exponent into radical notation as

$$\frac{1 - 5 \log 3x}{2} = \frac{1}{2} \log \frac{10}{3^{5x}} = \log \left(\frac{10}{3^{5x}} \right)^{\frac{1}{2}} = \log \sqrt{\frac{10}{3^{5x}}}.$$

Answer

$$\log \sqrt{\frac{10}{3^{5x}}}$$

2. If the parentheses were omitted then we can write the equality using the power rule

$$5 \log(3x) = \log(3^5 x^5) = \log(243x^5).$$

Since $\log 10 = 1$ by using the above equality and the quotient rule the difference can be rewritten as

$$1 - 5 \log(3x) = \log \frac{10}{243x^5}.$$

Hence the expression is condensed to a single logarithm by using the power rule and converting the rational exponent into radical notation as

$$\frac{1 - 5 \log(3x)}{2} = \frac{1}{2} \log \frac{10}{243x^5} = \log \sqrt{\frac{10}{243x^5}}.$$

Answer

$$\log \sqrt{\frac{10}{243x^5}}$$