10.3 laws of logs.notebook March 22, 2017

103 Cours of Coas

Warm-Up Wednesday Evaluate without your calculator

1.
$$3\log_2 8$$
 $2^2 = 8$
 $3 \cdot 3 = 9$

2.
$$\log_3(\log_3(\log_3 27))$$

 $3^2 = 27$
 $\log_3(\log_3 3)$ $3^2 = 3$
 $\log_3(1)$ $3^2 = 1$

- Then you meet someone new, what do you want them to know about you in the first 5 minutes?
- 2. Would you rather break someone else's heart, or have someone break yours?

PM. How do I expand or condense logarithmic expressions?

Note: All the laws of logarithms come from the laws of exponents.

1. The Product Law

Recall that for exponents $a^n \cdot a^m = \underline{a^m \cdot n}$

So,
$$\log_a(x \cdot y) = 100 a \times 100 a$$

EQ:

How do I expand or condense logarithmic expressions?

ວ່າ 2. The Quotient Law

Recall that for exponents $\frac{a^n}{a^m} = \underline{\qquad \qquad }$

So,
$$\log_a \left(\frac{x}{y} \right) = 100 \text{ a } x = 100 \text{ a } y$$

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Property How do I expand or condense logarithmic expressions?

3. The Power Law

Recall that for exponents $(a^m)^p = \underline{\qquad}$

So,
$$\log_a x^p = p \log_a x$$



EQ:

How do I expand or condense logarithmic expressions?

4. Some Other Properties

$$\log_b b^x = X$$

$$b^{\log_b x} =$$

$$\log_b 1 = 0$$

60

How do I expand or condense logarithmic expressions?

Example 1 - Express the following as multiple logarithms.

a)
$$\log_a x^2 y^3 z^5$$

b)
$$\log_b \frac{(xy^2)}{z^3}$$

E (C)

How do I expand or condense logarithmic expressions?

Example 2 - Express the following as a single logarithm. Simplify if possible.

a)
$$\frac{2}{3}\log_a x - \frac{1}{2}\log_a y$$

$$\log_a x^{2/3} - \log_a y^{1/2}$$

b)
$$\frac{1}{2}\log_a x + 3\log_a y - 2\log_a z$$

 $\log_a x^{h} + \log_a x^3 - \log_a z^2$
 $\log_a x^{h} + \log_a x^3 - \log_a z^2$
 $\log_a x^{h} + \log_a x^3 - \log_a z^2$
 $\log_a x^{h} + \log_a x^3 - \log_a z^2$

How do I expand or condense logarithmic expressions?

Example 3 - Evaluate. (number answer)

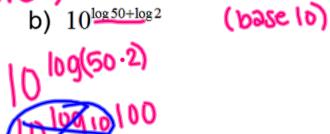
a)
$$\log_6 9 + \log_6 16 - \log_6 4$$

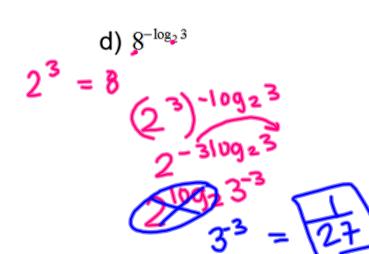
$$1096(\frac{9.16}{4})$$
 109636
 2
 $6? = 36$

$$G = 3^2$$

$$G = 3^2$$

$$G = 3^2 \cdot (3^2) \cdot 10935$$





10.3 – Laws of Logarithms

Name:

Evaluate

1.
$$\log_3 6 + \log_3 \frac{3}{2}$$

$$2. \log_2 5 + \log_2 10 - \log_2 25$$

$$3.\log_3 36 - \log_3 4$$

11.
$$\log_3(\log_3(\log_3 27))$$

12.
$$\log_2(\log_2(\log_2 16))$$

13.
$$\log(\log_2(\log_3 9)$$

Express as multiple logs.

$$15. \log_a 5x^2 y^3 z$$

16.
$$\log_b \frac{xy^2}{z^3}$$

17.
$$\log_a \sqrt[4]{\frac{xy}{z^3}}$$

18.
$$\log \frac{\sqrt{xyz}}{z}$$
 19. $\ln \sqrt{x^4 - 4x}$

19.
$$\ln \sqrt{x^4 - 4x^4}$$

20.
$$\ln \frac{x}{x^2 + 1}$$

Express as a single logarithm. Simplify and use radicals where needed.

21.
$$\frac{1}{2}\log_2 x + \frac{1}{3}\log_2 y - 2\log_2 x$$

$$22. \log_3 2x + 3(\log_3 x - \log_3 y)$$

23.
$$\ln x^2 - 2 \ln \sqrt{x}$$

24.
$$\ln(x^2-4) - \ln(x-2)$$

25.
$$\frac{1}{2}\log(x-1) + \frac{1}{2}\log(x^2+2) + \frac{3}{2}\log(x+4)$$
 26. $5\ln x + \ln\sqrt{y} + 2\ln z - \frac{1}{3}\ln w$

26.
$$5 \ln x + \ln \sqrt{y} + 2 \ln z - \frac{1}{3} \ln w$$



True or False.

27.
$$\frac{\log_a M}{\log_a N} = \log_a M - \log_a N$$

28. $\log_a 2x = 2\log_a x$

29. $\ln(M+N) = \ln M + \ln N$

$$28. \log_a 2x = 2\log_a 3$$

29.
$$\ln(M+N) = \ln M + \ln N$$

30.
$$\ln 2x = \ln 2 + \ln x$$

30.
$$\ln 2x = \ln 2 + \ln x$$
 31. $\frac{\log_a M}{\log_a N} = \log_a \frac{M}{N}$ 32. $\ln x^3 = 3 \ln x$

32.
$$\ln x^3 = 3 \ln x$$

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