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PRECALCULUS II

Practice Exercises (2.9.3)

A. EVALUATE EACH OF THE GIVEN EXPRESSIONS. (noncalculator)

1. $\log 8 + \log 125$

2. $\log_6 12 + \log_6 3$

3. $\log_3 27^5$

4. $\log_{\frac{1}{4}} 96 - \log_{\frac{1}{4}} 3$

5. $\log_8 16^8$

6. $2\log_{\sqrt{6}} 2 + 2\log_{\sqrt{6}} 3$

B. EVALUATE EACH OF THE GIVEN EXPRESSIONS (noncalculator)

Given: $\log_b 12 \approx 1.835$, $\log_b 4 \approx 1.024$

7. $\log_b 16$

8. $\log_b 3$

9. $\log_b 48$

10. $\log_b \frac{1}{3}$

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$\log_b 12 \approx 1.835$ $\log_b 4 \approx 1.024$

11. $\log_b 144$

12. $\log_b \frac{3}{4}$

C. REWRITE EACH OF THE GIVEN EXPRESSIONS AS A SUM AND/OR DIFFERENCE OF SIMPLER LOGARITHMS. ALSO WRITE THE EXPRESSION SO THAT THE EXPONENT OF EACH VARIBLE IS ONE.

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

14. $\ln a^5 b^2$

15. $\log_b \frac{p^3}{qt^2}$

D. REWRITE EACH OF THE GIVEN EXPRESSIONS AS A SINGLE LOGARITHM.

16. $4 \log_b d - 3 \log_b e$

17. $\frac{1}{2} \log_b a + 3 \log_b c - 4 \log_b e$

18. $5 \ln p - 2 \ln q - 3 \ln r$

Properties of Logarithms

Because a logarithm is actually an ____________________ the properties of logarithms follows the properties of powers.

The base of a logarithm can be any number other than ____________________

Simplify:

a) $\log_6 1 =$

b) $\log 1 =$

c) $\log_{56} 1 =$

Since $b^0 = 1$ for any nonzero b, this can be written as $\log_b 1 = 0$

Theorem: Logarithm of 1

For every base *b*, $\log_b 1 = 0$

Simplify:

a) $\log 10^2 =$

b) $\log_2 2^3 =$

c) $\log_{18} \sqrt{18} =$

Theorem: $\log_b$ of b^n

For every base b and any real number n, $\log_b b^n = n$

Simplify:

a) $\log 10 + \log 100$

$\log(10 \bullet 100) =$

b) $\log_2 8 + \log_2 4$

$\log_2 (4 \bullet 8) =$

This leads us to

Theorem: Product Property of Logarithms

For any base *b* and for any positive real number *x* and *y*:

$$\log_b(xy) = \log_b x + \log_b y$$

Example 1:

Simplify:

a) $\log_{12} 3 + \log_{12} 4$

b) $\log_6 2 + \log_6 108$

c) $\log_{15} 5 + \log_{15} 45$

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Theorem: Quotient Property of Logarithms

For any base b and for any positive real numbers x and y,

$$\log\left(\frac{x}{y}\right)=\log_b x-\log_b y$$

Simplify:

a) $\log 100-\log 10$

$\log\left(\frac{100}{10}\right)=$

b) $\log_3 81-\log_3 9$

$\log_3\left(\frac{81}{9}\right)=$

Example 2:
Simplify:

a) $\log_5 40-\log_5 8$

b) $\log_4 3-\log_4 48$

c) $\log_b x+\log_b y-\log_b z$

Theorem: Power Property of Logarithms
(aka: Cat out of the house)

For any base *b* and for any positive real number *x*,

$$\log_b x^n = n\log_b x$$

implify:

a) $\log_2 8^2$

$2\log_2 8=$

b) $\log_5 25^2$

$2\log_5 25=$

Example 3:
Rewrite as a single log:

a) $\log 85-\log 17+\frac{1}{2}\log 25$

Evaluate:

a) $2\log_6 6\sqrt{6}$

Example 4:
Solve for x:

$1=\log_7\left(\frac{x}{49}\right)$

b) $\log x=4\log 2+\log 3$

Express each logarithm as the sum or difference of simpler logs:

19. $\log_2 (xy) =$

20. $\log_2 (abc) =$

21. $\log_a 2x^{1/2} =$

22. $\log_a (bc)^2 =$

23. $\log_a \sqrt{bc} =$

24. $\log_b (\frac{\sqrt{x}}{y}) =$

Express each as a single logarithm with a coefficient of 1:

25. $\log_a x + \log_a y - \log_a z =$

26. $2 \log_a x - ½ \log_a y =$

27. $2(\log_a z - \log_a 3) =$

Simplify (WITHOUT A CALCULATOR):

28. $\log_6 2 + \log_6 3$

29. $\log_5 200 - \log_5 8$

30. $\log 85 - \log 17 + ½ \log 400$

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PRECALC

USING PROPERTIES OF LOGS

EXPRESS THE FOLLOWING IN TERMS OF a, b, and c,
GIVEN: $\log 2 = a$ $\log 3 = b$ $\log 5 = c$

1. $\log 4 =$

2. $\log 25 =$

3. $\log 10 =$

4. $\log 6 =$

5. $\log 15 =$

6. $\log \frac{9}{5} =$

7. $\log \sqrt[4]{3} =$

8. $\log \sqrt[3]{25} =$

9. $\log \frac{\sqrt{2}}{\sqrt[3]{5}} =$

10. $\log \sqrt{6} =$