

Test 13 - Study Guide

Use a calculator to approximate each to the nearest thousandth.

1) $\log_7 6.3 = \frac{\log 6.3}{\log 7} = .946$

2) $\log_5 6.5 = 1.163$

3) $\ln 4 = 1.386$

4) $\log_2 4.01 = 2.004$

Condense each expression to a single logarithm.

5) $5\log_6 x - 5\log_6 y$

$$\log_6 \frac{x^5}{y^5} = \log_6 \left(\frac{x}{y}\right)^5$$

6) $5\log_4 a + 6\log_4 b$

$$\log_4 (a^5 \cdot b^6)$$

7) $\log 11 + \log 3 + 2\log 7$

$$\log (11 \cdot 3 \cdot 7^2) =$$

8) $2\log_6 12 + 4\log_6 11$

$$\log_6 (12^2 \cdot 11^4)$$

Expand each logarithm.

9) $\ln (a \cdot b \cdot c^3)$

$$\ln a + \ln b + 3 \ln c$$

10) $\log_8 (z^4 \sqrt[3]{x})$

$$4\log_8 z + \frac{1}{3}\log_8 x$$

11) $\log_7 (c^2 \sqrt{a})$

$$2\log_7 c + \frac{1}{2}\log_7 a$$

12) $\ln (ab^4)^6$

$$\ln a^6 b^{24}$$

$$6\ln a + 24\ln b$$

Rewrite each equation in logarithmic form.

13) $b^a = 194$

$$\log_b 194 = a$$

14) $6^y = x$

$$\log_6 x = y$$

Rewrite each equation in exponential form.

15) $\log_7 70 = x$

$$7^x = 70$$

16) $\log_{\frac{7}{4}} m = n$

$$\left(\frac{7}{4}\right)^n = m$$

Solve each equation.

17) $4^{-2n} = 4^{-2n+1}$

$-2n = -2n + 1$
 $0 = 1$

No Solution

19) $\left(\frac{1}{6}\right)^{x-3} = 216$

$\frac{1}{6}^{x-3} = \frac{1}{6}^{-3}$

$x-3 = -3$
 $x = 0$

18) $8^{-2m-2} = 16^{-m}$

$(2^3)^{-2m-2} = (2^4)^{-m}$

$2^{-6m-6} = 2^{-4m}$
 $-6m-6 = -4m$
 $-6 = 2m$
 $-3 = m$

20) $216^{3k} = \left(\frac{1}{36}\right)^{3k+2}$

$(6^3)^{3k} = (6^{-2})^{3k+2}$
 $6^{9k} = 6^{-6k-4}$

$9k = -6k-4$
 $15k = -4$

$k = -4/15$

Solve each equation. Round your answers to the nearest ten-thousandth.

21) $2 \cdot 9^{x+9} = 39$

$\log(9^{x+9}) = \log(19.5)$

$(x+9) \cdot \log 9 = \frac{\log 19.5}{\log 9}$

22) $2 \cdot 8^{r+7} = 48$

$8^{r+7} = 24$
 $(r+7) \log 8 = \log 24$

$r+7 = \frac{\log 24}{\log 8}$

$r = 1.528 - 7$

$r = -5.472$

23) $20^{x-4} - 10 = 48$

$20^{x-4} = 58$

$\log(20^{x-4}) = \log 58$

$x-4 = \frac{\log 58}{\log 20}$
 $x = 1.352 - 4$
 $x = -2.648$

$x = 1.355 + 4 = 5.355$

24) $17^{-4b} + 2 = 35$

$17^{-4b} = 33$

$(-4b) \log 17 = \log 33$

$-4b = \frac{\log 33}{\log 17}$

$b = \frac{1.234}{-4} = -0.309$

25) $13^{x-10} - 4 = 45$

$13^{x-10} = 49$

$\log(13^{x-10}) = \log 49$

$(x-10) \log 13 = \log 49$
 $x-10 = \frac{\log 49}{\log 13}$
 $x = 1.517 + 10 = 11.517$

26) $6 \cdot 18^{a+1} = 79$

$18^{a+1} = 13.167$

$(a+1) \log 18 = \log 13.167$

$a+1 = \frac{\log 13.167}{\log 18}$

$a+1 = 0.892$ | $a = -0.108$

27) $3^{-2x} + 1 = 66$

$3^{-2x} = 65$

$\log(3^{-2x}) = \log 65$

$-2x \log 3 = \log 65$
 $-2x = \frac{\log 65}{\log 3}$
 $-2x = \frac{3.8}{-2}$
 $x = -1.9$

28) $-3 \cdot 14^{x-5} = -77$

$14^{x-5} = 25.667$

$(x-5) \log 14 = \log 25.667$

$x-5 = \frac{\log 25.667}{\log 14}$

$x = 1.23 + 5 = 6.23$

Solve each equation.

29) $\log_2 4x = \log_2 (3x+6)$

$4x = 3x+6$

$x = 6$

30) $\log_5 (2x+1) = \log_5 -2x$

$2x+1 = -2x$

$1 = -4x$ | $x = -1/4$

31) $\log_{13} (4x^2 + 13x) = \log_{13} (-30 + 3x^2)$

$4x^2 + 13x = -30 + 3x^2$

$x^2 + 13x + 30 = 0$ | $x = -10$ | $x = -3$

32) $\log_4 (a^2 + 37) = \log_4 (13a + 1)$

$a^2 + 37 = 13a + 1$

$a^2 - 13a + 36 = 0$

$a = 9$

$a = 4$

33) $\log_4 5x^2 - \log_4 5 = 1$

$\log_4 \frac{5x^2}{5} = 1$

$\log_4 x^2 = 1$

$4^1 = x^2$
 $4 = x^2$ | $x = \pm 2$

34) $\log_6 8 + \log_6 3x^2 = 5$

$\log_6 8(3x^2) = 5$

$\log_6 24x^2 = 5$

$6^5 = 24x^2$

$7776 = 24x^2$

$\frac{7776}{24} = x^2$

$x = \pm 18$

35) $\log_2 5x^2 + \log_2 5 = 2$

$\log_2 5(5x^2) = 2$

$\log_2 25x^2 = 2$

$2^2 = 25x^2$

$4 = 25x^2$

$\frac{4}{25} = x^2$ | $x = \pm \frac{2}{5}$

36) $\log_3 (x^2 - 6) - \log_3 10 = 1$

$\log_3 \frac{x^2-6}{10} = 1$

$3^1 = \frac{x^2-6}{10}$

$30 = x^2 - 6$

$36 = x^2$

$x = \pm 6$