

Calculus: Logarithms Quiz

Name: _____

SOLUTION GUIDES

50 TOTAL
29 FRONT
21 BACK

1. Solve the following exponential equations.

2a. $16^{-5x-11} = 32^{3x-14}$

$$(2^4)^{-5x-11} = (2^5)^{3x-14}$$

$$2^{-20x-44} = 2^{15x-70}$$

$$-20x-44 = 15x-70$$

$$26 = 35x$$

$$\frac{26}{35} = x$$

2b. $81^{2x-10} = (\frac{1}{9})^{4x-8}$

$$(3^4)^{2x-10} = (3^{-2})^{4x-8}$$

$$3^{8x-40} = 3^{-8x+16}$$

$$8x-40 = -8x+16$$

$$16x = 56$$

$$x = \frac{56}{16} = \frac{7}{2}$$

3b. $\log\left(\frac{(\sqrt[3]{x^2})(\sqrt[5]{y^4})}{\sqrt{z^5}}\right)$

$$= \log \sqrt[3]{x^2} + \log \sqrt[5]{y^4} - \log \sqrt{z^5}$$

$$= \log x^{\frac{2}{3}} + \log y^{\frac{4}{5}} - \log z^{\frac{5}{2}}$$

$$= \frac{2}{3} \log x + \frac{4}{5} \log y - \frac{5}{2} \log z$$

4. Solve algebraically, then give a final answer to 3 decimal places of accuracy.

2. Find the values of the following log expressions

2a. $\log_4 64 = x$

$$4^x = 64$$

$$4^x = 4^3$$

$$x = 3$$

2b. $\log_{25}(\frac{1}{125}) = x$

$$25^x = \frac{1}{5^3}$$

$$5^{2x} = 5^{-3}$$

$$2x = -3$$

$$x = -\frac{3}{2}$$

3a. $3^x = 29$

$$\log 3^x = \log 29$$

$$x \log 3 = \log 29$$

$$x = \frac{\log 29}{\log 3} = 3.065$$

3c. $\log_2 80 - \log_2 5$

$$\log_2 \left(\frac{80}{5}\right) = x$$

$$\log_2 (16) = x$$

$$2^x = 16$$

$$2^x = 2^4$$

$$x = 4$$

3d. $\log 400 + \log 25$

$$\log (400 \cdot 25) = x$$

$$10^x = 10000$$

$$10^x = 10^4$$

$$x = 4$$

3b. $5^{2x} = 43$

$$\log 5^{2x} = \log 43$$

$$2x \log 5 = \log 43$$

$$x = \frac{\log 43}{2 \log 5} = 1.168$$

3. Expand the following log expressions using the laws of logs.

a. $\log\left(\frac{a^2 b^3}{c^4 d^5}\right)$

$$= \log a^2 + \log b^3 - \log c^4 - \log d^5$$

$$= 2 \log a + 3 \log b - 4 \log c - 5 \log d$$

3c. $3^x = 4^{(x+3)}$

$$\log 3^x = \log 4^{x+3}$$

$$x \log 3 = (x+3) \log 4$$

$$x \log 3 = x \log 4 + 3 \log 4$$

$$x \log 3 - x \log 4 = 3 \log 4$$

$$x (\log 3 - \log 4) = 3 \log 4$$

$$x = \frac{3 \log 4}{\log 3 - \log 4} = \frac{3 \log 4}{\log \left(\frac{3}{4}\right)} = -14.486$$

SOLUTION GUIDE

Name:

21 BACK

Calculus: Logarithms Quiz

5. Use the change of base formulas to rewrite the following logarithmic expressions. Then calculate to three decimal places of accuracy.

3a. $\log_2 70$

$$= \frac{\log 70}{\log 2} = 6.129$$

3b. $\log_5 5.3$

$$= \frac{\log 5.3}{\log 5} = 1.036$$

6. Solve for x:

3a. $\log_5(3x+4) = 2$

$$5^2 = 3x+4$$

$$21 = 3x$$

$$\boxed{7 = x}$$

3b. $\log_2(x-4) + \log_2(x+2) = 4$

$$\log_2((x-4)(x+2)) = 4$$

$$x^2 - 2x - 8 = 16$$

$$x^2 - 2x - 24 = 0$$

$$(x-6)(x+4) = 0$$

$$\boxed{x=6} \quad x=-4$$

↑
EXTRA ANSWER

3c. $\log_3(2x+8) - \log_3(x-3) = 2$

$$\log_3\left(\frac{2x+8}{x-3}\right) = 2$$

$$\frac{2x+8}{x-3} = 9$$

$$9(x-3) = 2x+8$$

$$9x - 27 = 2x+8$$

$$7x = 35$$

$$\boxed{x=5}$$

3 7. If you invest \$10,000 at a 3.8% interest rate compounded monthly, to how much would your investment grow after 12 years?

Given: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

$$A = 10000 \left(1 + \frac{.038}{12}\right)^{12 \cdot 12}$$

$$A = 15766.14$$

3 8. A new teacher makes \$40,000 per year. Each year, the salary increases by 5% (established annually). Determine how long it will take for the teacher to earn \$75,000 per year.

$$75000 = 40000 \left(1 + \frac{.05}{1}\right)^{1 \cdot t}$$

$$75000 = 40000 (1.05)^t$$

$$\frac{15}{8} = 1.05^t$$

$$\log\left(\frac{15}{8}\right) = \log 1.05^t$$

$$\log\left(\frac{15}{8}\right) = t \log 1.05$$

$$\boxed{12.883 \text{ yrs.} = t}$$