

QUIZ 11

MATH 161

Thompson

- 1) Use the properties of logarithms to find the exact value of the expression. Do not use a calculator.

$$\log_4 24 - \log_4 6 \quad \frac{\log_4 24}{\log_4 6} = \log_4 4 = 1$$

- 2) Solve the following logarithmic equation.

$$4 \log_3 x = -\log_3 81 \quad \log_3 x^4 = -4$$
$$3^{-4} = x^4 \quad x = \frac{1}{3}$$

- 3) Write as the sum and/or difference of logarithms. Express powers as factors.

$$\log_4 \left(\frac{x^3}{y^6} \right) \quad 3 \log_4 x - 6 \log_4 y$$

- 4) Solve the following logarithmic equation.

$$\log x + \log (x+99) = 2 \quad \log x(x+99) = 2$$
$$x^2 + 99x = 10^2$$
$$x^2 + 99x - 100 = 0$$
$$(x+99)(x-1) = 0$$
$$x = -99, 1$$

- 5) Write the expression as a single logarithm.

$$3 \log_6 u + 6 \log_6 v \quad \log_6 (u^3 v^6)$$

- 6) Use properties of logarithms to find the exact value of the expression. Do not use a calculator.

$$\log_8 4 + \log_8 2$$

$$\log_8 4 \cdot 2 = x$$

$$\log_8 8 = x$$

$$x = 1$$

- 7) Write the expression as a sum and/or difference of logarithms. Express powers as factors.

$$\log \left[\frac{x(x+6)}{(x+5)^{10}} \right], x > 0$$

$$\log x + \log (x+6) - 10 \log (x+5)$$

8) $\log_a M^r = r \log_a M$

- 9) Solve the following logarithmic equation. Express irrational solutions in exact form and as a decimal rounded to three decimal places.

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

$$\log_5 (x+4)(x+3) = 2 \quad \text{foil } (x+4)(x+3) = 5^2$$

$$x^2 + 7x + 12 = 25$$

$$x^2 + 7x - 13 = 0$$

$$\frac{-7 + \sqrt{101}}{2}$$

only positive answer

plug into calculator $\frac{-7 + \sqrt{101}}{2} = 1.525$

10) $\ln e^9 = 9$ (Type an integer or a simplified fraction.)

11) Solve the following logarithmic equation. Express irrational solutions in exact form and as a rounded decimal. Verify your results using a graphing utility.

$$\ln x + \ln(x+8) = 4$$

$$\ln(x+8) = 4 \quad x^2 + 8x = e^4$$

$$x^2 + 8x = e^4$$

$$x^2 + 8x - e^4 = 0$$

$$\frac{-8 \pm \sqrt{64 - 4(e^4)}}{2}$$

factor out a 4 inside radical $\frac{-8 + \sqrt{4(16 + e^4)}}{2}$

take square root of 4 $\frac{-8 + 2\sqrt{16 + e^4}}{2}$

reduce $-4 + \sqrt{16 + e^4}$

plug into calculator $= 4.402$

12) Write as the sum and/or difference of logarithms. Express powers as factors.

$$\log_w \left(\frac{7x}{4} \right)$$

$$\log_w 7 + \log_w x - \log_w 4$$

13) Write the expression as a single logarithm.

$$\log_4 (x^2 - 64) - 4 \log_4 (x + 8)$$

$$\log_4 \left[\frac{(x-8)}{(x+8)^3} \right]$$

14) Solve the following logarithmic equation.

$$\frac{1}{2} \log_9 x = 2 \log_9 4$$

$$\cancel{\log_9} \sqrt{x} = \cancel{\log_9} 4^2$$

$$\sqrt{x} = 16 \text{ square both sides}$$

$$x = 256$$

15) Use the properties of logarithms to find the exact value of the expression. Do not use a calculator.

$$\log_{153} 9 + \log_{153} 17 \quad \log_{153}(9 \cdot 17)$$

$$\log_{153} 153 = 1$$

16) $\ln e^{-21} = -21$ (Type an integer or a simplified fraction.)

17) $\log_a a^r = r$