**Practice Test** 

**Exponentials and Logarithms** 

1. 
$$f(x) = \sqrt[3]{3x - 10}$$

$$X = \sqrt[3]{3y - 10}$$

3. 
$$f(x) = 3^x$$

Expand

5. 
$$\ln \sqrt{x^3(x+2)}$$

2. 
$$f(x) = \frac{1}{1+x}$$
  $x \ge 0$ 

$$x(1+y)=1$$

$$x+xy=1$$

$$y=\frac{1-x}{x}$$

$$4. \ f(x) = \ln(x)$$

$$6. \log_b \frac{\sqrt{xy^4}}{z^4}$$

7. 
$$\log_c \sqrt{\frac{x}{x+7}}$$

8. 
$$\log_3 \frac{x^3 y^2}{z}$$

9. 
$$\log_3 7t$$

10. 
$$2[\ln x - \ln(x+1) - \ln(x-1)]$$

$$\ln\left(\frac{x}{x^2-1}\right)^2$$

13. 
$$2\log_5 x + 7\log_5 x$$

$$log_5(x^9)$$

15. Show that 
$$ln\left(\frac{1}{5}\right) = -ln(5)$$

$$ln(1)-ln(5) = -ln(5)$$
  
 $0-ln(5) = -ln(5)$   
Solve

16. 
$$6^{5x} = 3000$$

$$X = \frac{\ln 3000}{5 \ln 6}$$
 $X = \frac{\ln 3000}{5 \ln 6}$ 

18. 
$$\log_3 x + \log_3 (x - 8) = 2$$

$$\begin{array}{c}
\log_3(x^2-8x) = 2 & (x-9)(x+1) = 0 \\
9 = x^2 - 8x \\
0 = x^2 - 8x - 9
\end{array}$$

20. 
$$\log_5(2x-3) = 2$$

12. 
$$2 \ln 8 + 5 \ln z$$

$$14. \log_b \frac{x+y}{z} - \log_b \frac{1}{x+y}$$

17. 
$$\log_4 x - \log_4 (x - 1) = \frac{1}{2}$$

$$\log_4(\frac{x}{x-1}) = \frac{1}{2}$$
  $2x-2=X$ 

$$2(x-1)=X$$

19. 
$$4^{-3t} = 0.10$$

$$-3t \ln 4 = \ln(0.10)$$

$$t = \frac{\ln(0.10)}{-3 \ln 4} \times .554$$

21. 
$$\log_{3/4} \frac{4}{3} = x$$

$$\frac{3}{4} \times \frac{4}{3} \times \frac{4}{3} \times \frac{1}{3}$$

22. 
$$3^{2x+1} = 27$$

$$30 \quad 2x+1=3$$

$$2x=2$$

- 23. Exponential functions cannot have a base of 1 because
- a) it can create imaginary numbers
- b) the graph would show exponential decay
- c) the graph would be a horizontal line
- d) the graph would show exponential growth

- 24. Exponential function cannot have a negative number as a base because
- a) imaginary numbers could arise
- b) the graph would show oscillations between negative and positive numbers
- c) you cannot take the log of a negative number
- d) a and b

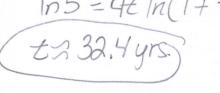
25. 
$$5^{\log_5 7} = 7$$
 because

$$a) f(f^{-1}(x)) = x$$

- b) logs and exponentials of the same base are inverse operations
- c) a composition of a function and its inverse simplifies to the original input value
- d) all answers choices are correct

- 26. A logarithm can be thought of as
- a) the reciprocal of an exponential function.
- b) unit of measure for money
- c) a reflection of an exponential function over the line y
- d) division by an exponent

27. If you invest \$2000 in a savings account at 5% annual interest compounded quarterly, how long will it take to accumulate a total of \$10,000? Solve algebraically.  $\ln 5 = 4t \ln \left(1 + \frac{05}{4}\right)$ 

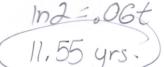


28. Dino, a student in Alg. II-Trig typed "In(0)" into the calculator and hit enter. He started to cry when an error message appeared on the screen. Why did he get an error message?

there is no value x that will transform e into 0.

29. If you invest \$1000 in a savings account at 6% annual interest compounded continuously, how long will it take for your money to double?

2=e.06t



30. Let f be a logarithmic function with base b (b>1). What is the range of f? Explain how you know.

$$f^{-1}(x) = b^{-1}(x) = b^{-$$

compounding.

See notes

32. What is a logarithm?

**33**. The concentration of hydrogen ions in a substance is denoted  $H^+$ .

The pH level of a substance is calculated with the formula

$$pH = -\log(H^+)$$

Find the concentrations of hydrogen ions in the following foods. Write your answers in scientific notation.

Food	pН	Concentrations
Apple-Golden Delicious	3.6	10-3.6 = 2.5 × 10
Cauliflower	5.6	10-5.6 = 2.5x10
Tofu	7.2	10-7-2 = 6.3x

$$3.6 = -\log(H^{\dagger})$$
  $5.6 = -\log(H^{\dagger})$   $-7.2 = \log H^{\dagger}$   
 $-3.6 = \log(H^{\dagger})$   $-5.6 = \log(H^{\dagger})$   $10^{-7.2} = H^{\dagger}$   
 $10^{-3.6} = H^{\dagger}$   $10^{-5.6} = H^{\dagger}$ 

$$5.6 = -\log(H^{\dagger})$$
  
 $-5.6 = \log(H^{\dagger})$   
 $6.6 = H^{\dagger}$ 

$$-7.2 = 109 H$$
 $10^{-7.2} = H^{+}$ 

- 34. Decibel levels are calculated with the formula  $db=10\log\left(\frac{I}{I_0}\right)$ . Where  $I_0$  represents the threshold of hearing,  $I_0=10^{-12}~W/m^2$ .
- a) The intensity of noise created by a chainsaw at a distance of 1 meter is about  $10^{-1} \ W/m^2$ . How many decibels is this sound?

b) The rustling of leaves has a sound level of about 10 decibels. Determine the intensity of this sound,

$$10 = 10\log\left(\frac{T}{10^{-12}}\right)$$
  $1 = \log\left(\frac{T}{10^{-12}}\right)$   $10^{1} = \frac{T}{10^{-12}}$   $T = 10^{-11}$ 

- **35.** A sample of 500 grams of lead-210 decays according to the function  $y = y_0 e^{-0.032t}$ .
- a) How much lead will be left in the sample after 20 years? Round to the nearest tenth.

b) Approximate the half-life of lead-210. That means to determine the amount of time required for there to be half of the original amount of lead. Round to the nearest tenth.

$$350 = 500e^{-.082t}$$

$$\frac{1}{2} = e^{-.032t}$$

$$\ln(\frac{1}{3}) = \ln(e^{-.032t})$$

$$\ln(\frac{1}{3}) = -.032t$$

$$t = \frac{\ln(\frac{1}{3})}{-.032} \approx 21.66 \text{ yrs.}$$