

Are you Ready?



Questions?

The last of logs

Logs on your calculator

Applications

H/W 6-72 to 75, 96 to 100, and 104

Note:

$\log(x)$ is the same as $\log_{10}(x)$

and

$\log_e(x)$ is the same as $\ln(x)$

$\log_b(x)$ can be solved in your calculator by
 $\log(x) / \log(b)$

You should be able to do these without a calculator. You are solving for x:

a) $\log_x(25) = 1$

b) $x = \log_3(9)$

c) $3 = \log_7(x)$

d) $\log_3(x) = 1/2$

e) $3 = \log_x(27)$

f) $\log_{10}(10000) = x$

g) $\log_e(e) =$

h) $\ln(e) =$

Solving with logs in your calculator

$$x = \log_{1.04}(2)$$

(change of base formula)

Solve using your calculator:

$$\log_3(42) =$$

$$\log_3 15.588 =$$

$$\log_{10}(120) =$$

$$\ln(42) =$$

$$\log_e 42 =$$

$$\log_5(1) =$$

$$\log_{12}(1) =$$

Are these equalities true?

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

$$\log_5 25 = \log_{25} 5$$

$$\log(x^2) = (\log x)^2$$

$$\log(7^x) = x \log(7)$$

$$\log(2x) = \log_2 x$$

$$\log_e(3x) = \ln(3x)$$

Solve for x:

a. $5 = 2.25^x$

b. $3.5^x = 10$

c. $2(8^x) = 128$

d. $2x^8 = 128$

Applications

Remember the equations for compound interest and half-life?

\$1,000 is invested at 6% interest compounded annually. In t years an investment will grow to the amount expressed by the function:

$$x(t) = 1000 \cdot 1.06^t, \text{ where } t \text{ is time in years}$$

How long will it take to accumulate \$2,000 in the account?

How long did it take for an investment account earning 3.5% pa compounded monthly to double?

You buy a new computer for \$2100. The computer decreases by 50% annually. When will the computer have a value of \$600?

You drink a beverage with 120 mg of caffeine. Each hour, the caffeine in your system decreases by about 12%. How long until you have 10mg of caffeine?

The foundation of your house has about 1,200 termites. The termites grow at a rate of about 2.4% per day. How long until the number of termites doubles?

A population of rabbits doubles every 4 months.
How many months did it take to go from two
rabbits to 12000 rabbits?

Carbon-15 has a half life of 2.449 seconds.
How long does it take for a sample of carbon-15
to lose half its mass?

An adult takes 400mg of ibuprofen. Each hour, the amount of ibuprofen in their system decreases by about 29%.

a) How much ibuprofen is in their system after 6 hours?

b) How long does it take for there to be 10% ibuprofen remaining?

A lump of Carbon-11 took 120 minutes to go from 100g to 20g. Find its half life.

Seismologists use the Richter scale to express the energy, or magnitude, of an earthquake. The Richter magnitude of an earthquake, M , is related to the energy released in ergs, E , shown by the formula:

$$M = \frac{2}{3} \log\left(\frac{E}{10^{11.8}}\right)$$

In 1964, an earthquake centered at Prince William Sound, Alaska, registered a magnitude of 9.2 on the Richter scale. Find the energy released by the earthquake.

Decibels are a measure of sound intensity. They are given by using the following formula:

$$dB = 20 \log_{10} \frac{p}{2 * 10^{-5}}$$

0.00002 Pa is the threshold of human hearing. It is the amount of pressure exerted on the ear measured in Pascals. To hear a change in volume the pressure must double.

$$dB = 20 \log_{10} \frac{p}{2 * 10^{-5}}$$

Hearing loss happens with continuous exposure to a sound pressure of 0.365 Pa.

How many times more pressure is this?

What is this in decibels?

$$dB = 20 \log_{10} \frac{p}{2 * 10^{-5}}$$

If instantaneous hearing damage happens at 120dB what is the increase in sound pressure?

A sound engineer uses the formula

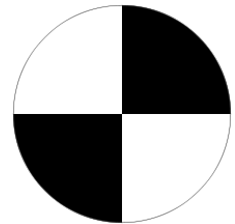
$$L_{d2} = L_{d1} + 20 \log_{10} \frac{1}{d2}$$

to calculate the sound level at distance $d2$ from the microphone and using the reference sound level measured at 1m from the sound source.

The Secchi disk is used to measure water turbidity.

The formula:

$$\frac{I_z}{I_0} = e^{-kd}$$



is used to calculate the level of turbidity (k) by looking at light intensity (I_z) at some depth (d) with respect to the intensity at the surface (I_0).



If the turbidity coefficient (k) is

$$\frac{I_z}{I_o} = e^{-kd}$$

0.5 at 10m depth, find the light intensity ratio at that depth.

If at 12m the light intensity is 1/4 of the surface intensity, find the turbidity coefficient.

$$\frac{I_z}{I_o} = e^{-kd}$$

A skydiver jumps from a plane. His speed of descent is given by $V(t) = 50(1 - e^{-0.2t})$ m/s, where t is the time in seconds.

How long will it take for his speed to reach 40 m/s?

Alex has money for half her college fees saved. She needs to double her money in ten years. Most investment accounts offer compounded monthly accounts, but what is the smallest annual interest rate she needs to make her goal.

Use Newton's Law of Cooling, $T = C + (T_0 - C)e^{-kt}$, to solve this exercise. At 9:00 A.M., a coroner arrived at the home of a person who had died during the night. The temperature of the room was 70 degrees F, and at the time of death the person had a body temperature of 98.6 degrees F. The coroner took the body's temperature at 9:30 A.M., at which time it was 85.6 degrees F, and again at 10:00 A.M., when it was 82.7 degrees F. At what time did the person die??????

$$T = C + (T_0 - C)e^{-kt}$$

If you do not know what the variable's mean...these are their meanings:

T = temperature of a heated object

C = constant temperature of the surrounding medium (the ambient temp)

T₀ = initial temperature of the heated object

k = negative constant associated with the cooling object

t = time (in minutes)

Climbing Mt. Everest is not an easy task! Not only is it a difficult hike, but the Earth's atmosphere decreases exponentially as you climb above the Earth's surface, and this makes it harder to breathe. The air pressure at the Earth's surface (sea level) is approximately 14.7 pounds per square inch (or 14.7 psi). In Denver, Colorado, elevation 5280 feet, the air pressure is approximately 12.15 psi.

a) Write the particular equation representing this data expressing air pressure as a function of altitude. (Note: You will need to carry out the decimal values several places to get an accurate equation and air pressures.)

b) What is the air pressure in Mexico City, elevation 7300 feet?

c) At the top of Mt. Everest, elevation 29,000 feet?

d) At what altitude will the air pressure be half that of sea level?

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Stop

Inverse Review

Give the inverse.

$$y = 3x - 6$$

Is it a function?

Give the inverse

$$f(x) = \frac{1}{2} \left(\frac{x-1}{4} \right)^2$$

Is it a function?

Give the inverse.

Is it a function?

Give the inverse.

$$f(x) = 3x^3 - 2$$

Is it a function?

Give the inverse.

$$f(x) = 54(x - 2)^3 - 2$$

Is it a function?

Give the inverse.

$$f(x) = \frac{2}{x}$$

Is it a function?

Give the inverse.

$$f(x) = \frac{3}{x-6}$$

Is it a function?

Give the inverse.

$$f(x) = \frac{x+4}{x-1}$$

Is it a function?

Give the inverse.

$$f(x) = (x + 2)^2$$

Is it a function?

Give the inverse.

$$f(x) = x^2 + 4x + 4$$

Is it a function?

Give the inverse.

$$f(x) = (x + 2)(x - 2)$$

Is it a function?

Give the inverse.

$$f(x) = \frac{x^2 - 2x - 3}{x + 1}$$

Is it a function?

Use the property of logs to rewrite in a simpler form if possible.

$$\log_3 2x - \log_3 2 + \log_3 x$$

Use the property of logs to rewrite in a simpler form if possible.

$$\ln(2x + 3) + \ln(x)$$

Use the property of logs to rewrite in a simpler form if possible.

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$$\frac{\log_4 2x}{\log_4 x} + \frac{\log_4 (x+2)}{\log_4 4}$$

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February 8, 2019

