c) How long until 6,312 cells

$$P = 4 \cdot 2^x$$

$$\frac{6312}{4} = \frac{4 \cdot 2^x}{4}$$

$$1578 = 2^x$$

oh, crap!

$\log_2$ base

log base 10

$\log_2 1578 = x$

take the log of both side

$x = \log_2 1578$

$\log(1578) = \log(2^x)$

$\frac{\log(1578)}{\log(2)} = \frac{x \cdot \log(2)}{\log(2)}$

$x = \frac{\log 1578}{\log 2}$

$x = 10.623$ hrs

↑ hours

Ex1)

$$5000 = 3 \cdot 4^{(x+1)} - 5$$

$$+5 \qquad +5$$

$$\frac{5005}{3} = \frac{3 \cdot 4^{(x+1)}}{3}$$

$$1668.33 = 4^{(x+1)}$$

$$\log 1668.33 = \log\left(4^{x+1}\right)$$

$$\frac{\log 1668.33}{\log 4} = \frac{(x+1) \cdot \log 4}{\log 4}$$

$$-1 \qquad -1$$

$$x = \frac{\log 1668.33}{\log 4} - 1$$

Questions from HW 43

47) $7^{\log_7 9} + \log_2 8$

$9 + 3$

$\boxed{12}$

log form $\log_2 8 = ?$

exp form $2^? = 8$

$2^3 = 8$

$? = 3$

21) $\log_4 60 =$

$\log_4(5 \cdot 3 \cdot 4)$

$\log_4(5) + \log_4(3) + \log_4(4)$

$1.161 + 0.7925 + 1$

Given in table

$\log_4 5 = 1.161$

$\log_4 3 = 0.7925$

$\log_4 4 = 1$

59)

$$2\log_a x + \log_a 2 = \log_a(5x+3)$$

$$\log_b(x) = \log_b(y)$$

$$x = y$$

$$\log_a(x^2) + \log_a 2 = \log_a(5x+3)$$

$$\log_a(2x^2) = \log_a(5x+3)$$

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

$$2x^2 - 5x - 3 = 0$$

$$x = \frac{5 \pm \sqrt{(-5)^2 - 4(2)(-3)}}{2(2)}$$

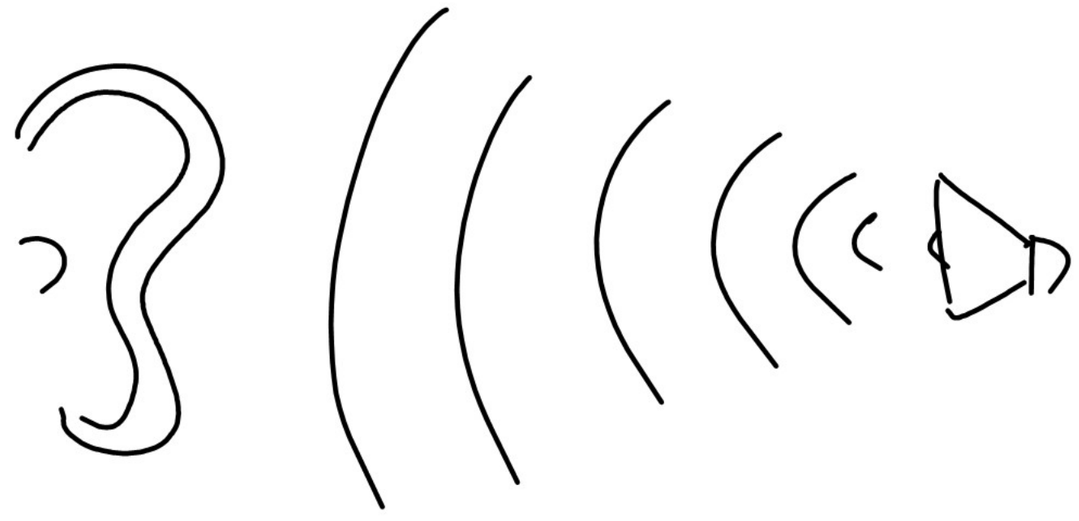
$$x = \frac{5 \pm \sqrt{25+24}}{4}$$

$$x = \frac{5 \pm \sqrt{49}}{4} = \frac{5 \pm 7}{4}$$

$$x = \frac{5+7}{4} = \boxed{3} \qquad x = \frac{5-7}{4} = \boxed{-\frac{1}{2}}$$

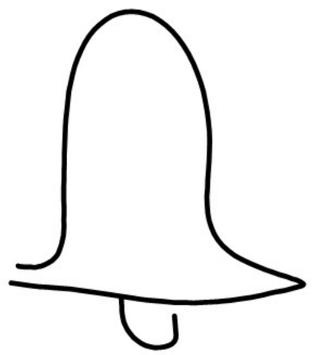
6.5 Applications of Logs

Topic



Sound intensity

Vocab Word

0.38 + 

decibel

+ enth Bell

decibel is a tenth of a Bell

Sound Intensity

$$R = 10 \cdot \log\left(\frac{I}{I_0}\right)$$

- R: relative intensity (measured in decibels)
- log: base 10
- I: intensity of sound you're measuring
- I_0: intensity of threshold of hearing (softest sound recognizable by human ear)

$$\frac{I}{I_0} \equiv \text{ratio of intensities}$$

$$I_0\left(\frac{I_{voice}}{I_0}\right) = (500)(I_0)$$

$$I_{voice} = 500 \cdot I_0$$

Ex 1) Background music is 1000 times louder than the threshold of hearing (I_0)

How many decibels is the music?

$$I_{B.M} = 1000 \cdot I_0$$

$$R = 10 \log\left(\frac{I_{B.M}}{I_0}\right)$$

$$R = 10 \log\left(\frac{1000 I_0}{I_0}\right)$$

$$R = 10 \log(1000)$$

$$R = 10.3$$

$$\boxed{R = 30 \text{ dB}}$$

Ex 2) Rise Against concert measures 115 dB. How many times louder than the threshold of hearing is the concert?

$$\beta = 10\log\left(\frac{I_{R.A.}}{I_0}\right)$$

$$\frac{115}{10} = \frac{10\log\left(\frac{I_{R.A}}{I_0}\right)}{10}$$

$$11.5 = \log_{10}\left(\frac{I_{R.A}}{I_0}\right)$$

$$10^{11.5} = \frac{I_{R.A}}{I_0}$$

$$I_{R.A} = 10^{11.5} \cdot I_0$$

$10^{11.5}$ times as loud

$\approx$ 300 billion times as loud.

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uman ear is sensitive to a range of sound intensities.

Type of sound	Relative intensity, R (in dB)
threshold of hearing	0
whisper	≈20
soft music	≈30
conversation	≈65
rock band	≈100
threshold of pain	120

e-10 logarithm is called the *common logarithm*. The **common** m, $\log_{10} x$, is usually written as $\log x$.

of values and a graph for $y = \log x$ are given below. Notice that the n the domain increase quickly (by a factor of 10), while values in the ncrease slowly (by adding 1). In general, logarithmic functions are used

domain to small values in the range.

1. $10^x =$
2. $10^x =$
3. $10^x =$

Find th
equatio
4. $-3 =$
5. $2 = l$
6. $v = l$

Also on

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Select Image Size
1600x1200 (2 MP) ◀

Take Photo

Record Video

Solving exponential equations

4 cells, double every hour

how long until 128?

$$P = P_0 \cdot b^x$$

$$P = 4 \cdot 2^x$$

$$\frac{128}{4} = \frac{4 \cdot 2^x}{4}$$

$$32 = 2^x$$

$X = 5$ hours in your head

c) When is the pop 5,512?

$$P = 4 \cdot 2^x$$

$$\frac{5513}{4} = \frac{4 \cdot 2^x}{4}$$

$$2^x = \frac{5513}{4}$$

$$\log(2^x) = \log\left(\frac{5513}{4}\right)$$

$$\frac{x \cdot \log(2)}{\log(2)} = \frac{\log\left(\frac{5513}{4}\right)}{\log(2)}$$

$$x = \frac{\log(5513/4)}{\log(2)}$$

$$x = 10.429 \text{ hr}$$

$$\log_5 83 = ?$$

$$5^{?} = 83$$

$$5^{x} = 83$$

$$\log(5^x) = \log 83$$

$$\frac{x \log 5}{\log 5} = \frac{\log 83}{\log 5}$$

$$x = \frac{\log 83}{\log 5} \approx 2.75$$

HW 44

6.5

due tues 1/19