

Questions on 2.9H HW? 2.8H HW is due today. Today, we will finish up 2.9H and work on our module 2 Study Guide - our test is next class!

Strategies for solving log/exp equations

- Rewrite: $\text{exp} \rightarrow \text{log}$ or $\text{log} \rightarrow \text{exp}$
also $\ln \square = \log_e \square$

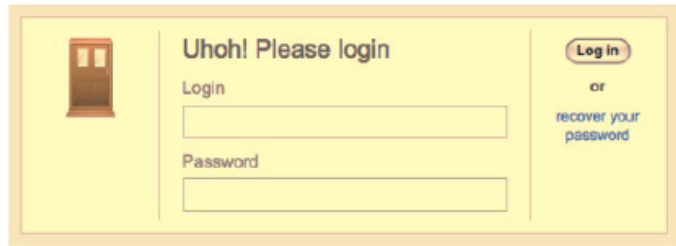
- When log/exp bases are the same, drop log bases/exp. bases

* Sometimes we use log/exp. rules to simplify first.

- Take log or ln of both sides.

2.9H Don't Forget Your Login

A Practice Understanding Task



Solve each of the following equations. When you have finished, sort the equations into categories based upon the strategy you used to solve them. Name each category and then describe how to solve equations in this category.

1. $\log 3x = 2$

$$10^2 = 3x$$

2. $-3 = \log_x \frac{1}{125}$

$$3 = -\log_x \frac{1}{125}$$

$$3 = \log_x \left(\frac{1}{125}\right)^{-1}$$

$$3 = \log_x 125$$

$$\sqrt[3]{x^3} = \sqrt[3]{125}$$

$$x = 5$$

The rate at which caffeine is eliminated from the bloodstream of an average adult is about 15% per hour. If the peak level of caffeine in the bloodstream is 30 milligrams, the amount of caffeine left in the bloodstream t hours after the caffeine reaches its peak level can be modeled by the function: $C(t) = 30(0.85)^t$. After how many hours will there be 15 mg left in the bloodstream?

4. $x = \log_5 100$

5. $\ln(5x - 3) + \ln 2 = \ln(24 - 2x)$

6. $\log_5(4x - 3) = \log_5 29$

$$4x - 3 = 29$$

$$\ln[(5x-3)2] = \ln(24-2x)$$

$$2(5x-3) = 24-2x$$

$$15 = 30(0.85)^t$$

$$\frac{15}{30} = \frac{30}{30}(0.85)^t$$

$$0.5 = (0.85)^t$$

$$\log 0.5 = t \log 0.85$$

$$t = \frac{\log 0.5}{\log 0.85}$$

7. The Richter scale, which measures the magnitude of earthquakes is a logarithmic scale, where the magnitude of the earthquake, M depends on the energy released by the earthquake E . In 1994, an earthquake of magnitude 6.6 on the Richter scale injured thousands of people and cost billions of dollars in damages. That earthquake could be modeled with the equation $6.6 = \frac{3}{2} \log \left(\frac{E}{10^{11.8}}\right)$. Find the energy released by the earthquake.

$6 \frac{6}{10}$

8. $\log_5(3x + 1) = 2$

$$6.6 = \frac{3}{2} \log \left(\frac{E}{10^{11.8}}\right)$$

$$9.9 = \log \left(\frac{E}{10^{11.8}}\right)$$

$$10^{9.9} = \frac{E}{10^{11.8}}$$

OR

$$10^{9.9} = 10^{\log \left(\frac{E}{10^{11.8}}\right)}$$

$$10^{9.9} = \frac{E}{10^{11.8}}$$

9. $\log_b x^3 = \log_b 27$
10. Ever wonder why suddenly your kitchen is full of fruit flies? Given good conditions, fruit fly populations can grow at the amazing rate of 28% per day. If 25 fruit flies enter your house to hang out on a piece of ripe fruit, the fly population after t days can be modeled as: $P(t) = 25(1.28)^t$. How long will it take for you to have 100 little fruit flies buzzing around?
11. $\log_x 5 = \frac{1}{4}$ 12. $3^x = 5^{2.3}$
13. $\log_2 2x - \log_2(x - 2) = \log_2 3$ 14. $\log_3 2x = \log_3(x - 1)$
15. $\ln(x - 1) = 3$
17. $x = \log_3 10$ 18. $2\log_a x + \log_a 2 = \log_a(5x + 3)$
19. $3 + 7^{3x+1} = 346$

16. $\log(x^2 - 2) + 2\log 6 = \log 6x$

$\log(x^2 - 2) + \log 6^2 = \log 6x$

$\log(36(x^2 - 2)) = \log(6x)$

$36x^2 - 72 = 6x$

$36x^2 - 6x - 72 = 0$

$6(6x^2 - x - 12) = 0$

$6((6x^2 - 9x) + (8x - 12)) = 0$

$6[3x(2x - 3) + 4(2x - 3)] = 0$

$6(2x - 3)(3x + 4) = 0$

$(2x - 3)(3x + 4)$

$(3x)(2x)$

$(6x)(x)$

$(x)(6x)$

Homework

Finish 2.9H "Ready, Set, Go"