

Questions on 2.9H HW? 2.8H HW is due today...and no quiz. Today, we will finish up 2.9H and work on our module 2 Study Guide - our test is next class!

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**Solve for x in each equation.**

1.  $x^2 + x - 2 = 0$   
 $(x+2)(x-1) = 0$   
 $x = -2, 1$

2.  $2x - 6 = 0$   
 $2 \cdot -1 \quad 2 + -1 = 1$

4.  $x^3 - 4x = 0$   
 $x(x^2 - 4) = 0$   
 $x(x+2)(x-2) = 0$   
 $x = -2, 2, 0$

3.  $0 = \log_2 x$

5. Match each of the graphs below with one of the above equations. Explain the criteria you used to decide which graph was related to each equation.

a) Equation?      How did you know?

b) Equation?      How did you know?

c) Equation?      How did you know?

d) Equation?      How did you know?

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-2	sum
-2 · 1	-2 + 1 = -1
2 · -1	2 + -1 = 1

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**Use the properties of logarithms to rewrite each expression in expanded form. Assume all variables represent positive real numbers.**

24.  $\log_4 4x^3 = \log_4 4 + \log_4 x^3 = 1 + 3\log_4 x$

25.  $\log_5 \sqrt{\frac{m}{n}} = \log_5 \left(\frac{m}{n}\right)^{\frac{1}{2}} = \frac{1}{2}(\log_5 m - \log_5 n)$  or  $\frac{1}{2}\log_5 m - \frac{1}{2}\log_5 n$

26.  $\log_3 \frac{9w}{xyz}$

27. The number of fish in an aquarium is given by  $f(t) = 4\log(5t + 10)$ , where  $t$  is time in months. Find the number of fish present given the following times. Then graph  $f(t)$ .

a)  $t = 0$       b)  $t = 12$       c)  $t = 24$       d)  $t = 36$       e)  $t = 60$       f)  $t = 72$

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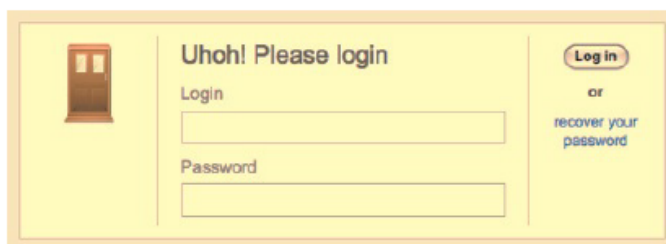
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## Solving Log/Exp Equations

- Same log base, drop logs.
- Same exp base, drop bases.
- Rewrite:  $\log \rightarrow \exp$  or  $\exp \rightarrow \log$
- Use properties to condense into one log

## 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.  $\log 3x = 2$

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

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

$$4x - 3 = 29$$

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

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

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:  $6.6 = \frac{2}{3} \log \left( \frac{E}{10^{11.8}} \right)$ . Find the energy released by the earthquake.

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

$$5^2 = 3x + 1$$

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.  $3^x = 5^{2.3}$

$$\log 3^x = \log 5^{2.3}$$

$$\frac{x \cdot \log 3}{\log 3} = \frac{2.3 \log 5}{\log 3}$$

$$x = \frac{2.3 \log 5}{\log 3}$$

13.  $\log_2 2x - \log_2(x-2) = \log_2 3$

14.  $\log_3 2x = \log_3(x-1)$

$$2x = x - 1$$

15.  $\ln(x-1) = 3$

$$\log_e(x-1) = 3$$

$$e^3 = x - 1$$

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

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

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

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

17.  $x = \log_3 10$

18.  $2 \log_a x + \log_a 2 = \log_a(5x + 3)$

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

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

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

19.  $3 + 7^{3x+1} = 346$



# Homework

## Finish 2.9H "Ready, Set, Go"

$$\textcircled{14} \quad 9^{2x} = 27^{3x-4}$$

$$3^{2(2x)} = 3^{3(3x-4)}$$

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

$$4x = 9x - 12$$

$$+12 \quad -4x \quad +12$$

$$12 = 5x$$

$$\frac{12}{5} = x$$

OR

$$\log 9^{2x} = \log 27^{3x-4}$$

$$2x \log 9 = (3x-4) \log 27$$

$$2x \log 9 = 3x \log 27 - 4 \log 27$$

$$-3x \log 27 - 3x \log 27$$


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$$2x \log 9 - 3x \log 27 = -4 \log 27$$

$$x(2 \log 9 - 3 \log 27) = -4 \log 27$$

$$x = \frac{-4 \log 27}{2 \log 9 - 3 \log 27}$$