

Name _____
Date _____

Advanced Algebra
Unit 3: Exponential, Log and Power Functions
Assignment #3

(This is our third assignment with solving exponential equations. It is very important to understand that when you see an exponential equation that we understand that we will use our algebraic steps to ISOLATE the base. After we ISOLATE the base we are using our calculator to look up in a table what is the closest answer. Soon we will move on to another method. However, you always can use the calculator method.)

Example:

$190 + 22 \cdot 3^x = 1096$

$22 \cdot 3^x = 906$. Subtracted 190 from both sides.

$3^x = 41.18$ Divided both sides by 22. Now the base is isolated

Putting 3^x into my calculator, we find that $x = 3.38$.

1) $4^x = 125$

$\log_4 4^x = \log_4 125$
 $x \log_4 4 = \log_4 125$

3. $16^x = \frac{1}{4096}$

$x = 3.48$

$\log_{16} 16^x = \log_{16} \left(\frac{1}{4096}\right)$

$x \log_{16} 16 = \log_{16} \left(\frac{1}{4096}\right)$
 $x = -3$

5. $4^x \cdot 4^{x-2} = \sqrt{8}$

$4^{x+x-2} = \sqrt{8}$
 $4^{2x-2} = \sqrt{8}$
 $\log_4 4^{2x-2} = \log_4 \sqrt{8}$
 $2x-2 = \frac{0.75}{2}$
 $x = 1.375$

7. $3^{x+3} = 729$

$3^x = 729$
 $3^6 = 729$
so $x+3 = 6$
so $x = 3$
The exponent needs to equal 6

9. $2^x = \frac{18}{\sqrt{10}}$

$2^x = 5.69$
Search Table
 $x = 2.51$

2. $4 \cdot 5^x = 95$

$5^x = 23.75$
 $\log_5 5^x = \log_5 23.75$
 $x = \log_5 23.75$
 $x = 1.968$

4. $7^x + 12 = 110$

$7^x = 98$
 $\log_7 7^x = \log_7 98$
 $x \log_7 7 = \log_7 98$
 $x = 2.3562$

6. $3^x = \frac{1}{243}$

$3^x = 243$
 $3^5 = 243$
so $x = -5$

8. $\sqrt[4]{129} = 4^x$

$(129)^{\frac{1}{4}} = 4^x$
 $2.248 = 4^x$
Search Table
 $x = .58$

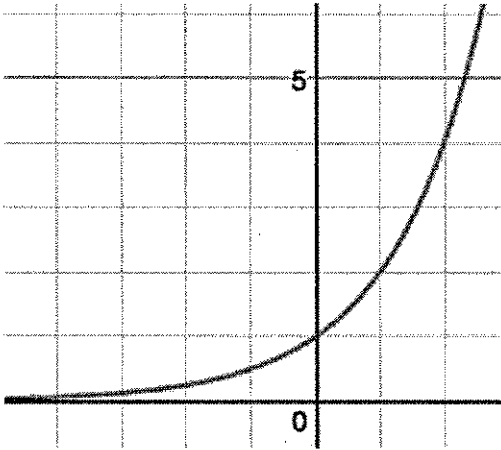
10. $4 \cdot 6^x = 962$

$6^x = 240.5$
Search Table
 $x = 3.06$

Assignment #3

I know what the base graph for an exponential equation looks like (repeat from Unit 1)

I can find an x intercept (Repeat from Unit 2)



So from the graph, we know that the parent graph of $y=2^x$, does not have any x intercepts. So it will only have x intercepts if it is shifted below the x axis. Then we know to put 0 in for y and start solving an exponential equation.

Use your knowledge of shifts and your algebra of solving an exponential equation to find the x intercept of the following.

11) $y = 3^x$

 none

13) $y = 18 + 2^x$

 none

15) $y = -100 + 18^x$
 $x = 1.59$

12) $y = 4^x - 18$
 $0 = 4^x - 18$
 $18 = 4^x$
 $x = 2.08$

14) $y = 7^x - 25$
 $0 = 7^x - 25$
 $25 = 7^x$
 $x = 1.65$

16) $y = -25 + 2 \cdot (4^x)$
 $25 = 2 \cdot 4^x$ $12.5 = 4^x$
 $x = 1.82$

17) A boat is purchased for \$40,000. The boat depreciates 7.5% every year. Around how many years (answer needs to be to the tenth place) will it take for the boat to be worth \$19,500?

$19,500 = 40,000(1 - .075)^x$ $.4875 = (1 - .075)^x$ $x = 9.22$

18) An investment is made in an account that earns interest. The initial amount of the investment was \$14,000. The APR on this account is 9%. Around how many years will it take for this investment to grow to \$22,000

$22,000 = 14,000(1 + .09)^x$
 $1.57 = (1 + .09)^x$ $x = 5.23$

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26) A car is purchased for \$19,500. The car depreciates by 11% every year. Around how many years (answer needs to be to the tenth place) will it take for the car to be worth around \$13,200?

$$13,200 = 19,500(1 - .11)^x$$

$$.6769 = (1 - .11)^x$$

$$x = 3.35$$

27) An investment is made in an account that earns interest. The initial amount of the investment was \$12,000. The APR on this account is 8%. Around how many years will it take for this investment to grow to \$18,000

$$18,000 = 12,000(1 + .08)^x$$

$$1.5 = (1 + .08)^x$$

$$x = 5.27$$

28) You deposit \$500 into an account that earns 4% APR compounded quarterly. After how many years will it take for the account to be worth \$1,300?

$$1,300 = 500\left(1 + \frac{.04}{4}\right)^x$$

$$2.6 = \left(1 + \frac{.04}{4}\right)^x$$

$$x = 96 \text{ quarters}$$

29) You deposit \$12,000 into an account that earns 7% APR compounded monthly. After how many years will it take for the account to be worth \$22,000?

$$22,000 = 12,000\left(1 + \frac{.07}{12}\right)^x$$

$$1.833 = \left(1 + \frac{.07}{12}\right)^x$$

$$x = 104 \text{ months}$$

30) A bacteria doubles every single hour in the lab. The initial amount of bacteria was 300g. After how many hours will it take for the bacteria to be over 12,000g?

$$12,000 = 300(2)^x$$

$$40 = 2^x$$

$$5.32$$