

key point

$\log_{\text{base}} \text{Answer} = \text{exponent}$

Name _____

Date _____

Advanced Algebra
Unit 3 Exponential, Log and Power function

Solving Exponential Equations Assignment #17

Remember $\ln x = \log_e x$

3, 333, 333

Solve each equation:

1) $2 + 6 \log x = 10$ $6 \log x = 8$ $\log x^6 = 8$ $\log_{10} x^6 = 8$ $10^{\frac{8}{6}} = x$ $x = 21.5$	2) $5 \log x - 8 = 4$ $5 \log x = 12$ $\log x = \left(\frac{12}{5}\right)$ $\log_{10} x = \left(\frac{12}{5}\right)$ $10^{\frac{12}{5}} = x$ $x = 251$	3) $3 \log 3x = 21$ $\log (3x)^3 = 21$ $\log_{10} (3x)^3 = 21$ $10^{21} = (3x)^3$	4) $7 + 8 \ln x = 2$ $8 \ln x = -5$ $\ln x = \left(-\frac{5}{8}\right)$ $e^{-\frac{5}{8}} = x$ $x = 0.535$
5) $9 - 3 \ln x = 6$ $-3 \ln x = -3$ $\ln x = 1$ $\log_e x = 1$ $e^1 = x$ $x = e$	6) $4 \ln 4x = 14$ $\ln 4x = \left(\frac{14}{4}\right)$ $\log_e 4x = \left(\frac{14}{4}\right)$ $e^{\frac{14}{4}} = 4x$ $x = 8.3$	7) $4e^x + 10 = 50$ $4e^x = 40$ $e^x = 10$ $\log_e 10 = x$ $\ln 10 = x$ $x = 2.3$	8) $7e^x - 32 = 45$ $7e^x = 77$ $e^x = 11$ $\log_e 11 = x$ $\ln 11 = x$ $x = 2.4$
9) $6e^{2x} - 6 = 66$ $6e^{2x} = 72$ $e^{2x} = 12$ $\log_e 12 = 2x$ $\ln 12 = 2x$ $x = 1.24$	10) $10^x - 2 = 74$ $10^x = 76$ $\log_{10} 76 = x$ $x = 1.88$	11) $10^{\frac{1}{2}x} + 32 = 111$ $10^{\frac{1}{2}x} = 79$ $\log_{10} 79 = \frac{1}{2}x$ $x = 3.8$	12) $10^{-4x} - 88 = 4$ $10^{-4x} = 92$ $\log_{10} 92 = -4x$ $x = -.49$
13) $3 + 5 \log x = 18$ $5 \log x = 15$ $\log x = 3$ $10^3 = x$ $x = 1000$	14) $6 \log x - 1 = 11$ $6 \log x = 12$ $\log x = 2$ $10^2 = x$ $x = 100$	15) $4 \log \frac{1}{2}x = 7$ $\log_{10} \frac{1}{2}x = \left(\frac{7}{4}\right)$ $10^{\frac{7}{4}} = \frac{1}{2}x$ $x = 112$	16) $-9 + 2 \ln x = -5$ $2 \ln x = 4$ $\ln x = 2$ $\log_e x = 2$ $e^2 = x$ $x = 7.389$
17) $10 - 7 \ln x = 5$ $-7 \ln x = -5$ $\ln x = \frac{5}{7}$ $\log_e x = \frac{5}{7}$ $e^{\frac{5}{7}} = x$ $x = 2.04$	22) $5 \ln 5x = 23$ $\ln 5x = 4.6$ $\log_e 5x = 4.6$ $e^{4.6} = 5x$ $x = 19.9$		

I can Model real life Appreciation and Depreciation Problems:

Write the equation for each of the following exponential problems and solve using logs.

- 1) The value of a brand new \$28,000 car that is depreciating at a rate of 16% per year, can be modeled by the equation $v=28,000(1-.16)^t$ where t is the time in years. After how many years will the car be worth \$14,000
- 2) You deposit \$14,000 into an account that earns 7% interest. After how many years will the account be worth \$16,000?
- 3) You deposit \$12,000 into an account that earns 7% interest compounded monthly. After how many years will the account be worth \$17,000?
- 4) You deposit \$18,000 into an account that earns 5% interest compounded quarterly. After how many years will the account be worth \$30,000?
- 5) What is the solution to $5^x = 44$

A	B	C	D
.9445	6332	.4253	2.3512

~~44~~ $\log_5 44 = x$

$\log_5 20 = -5x$

- 6) What is the solution to $3^{5x} = 20$

A	B	C	D
-4.000	-.5454	-.6021	.8239

① $y = 28,000(1-.16)^x$
 $14,000 = 28,000(.84)^x$
 $\frac{1}{2} = .84^x$

$\log_{.84} .5 = x$

$x = 3.98 \text{ years}$

③ $y = 12,000(1 + \frac{.05}{12})^x$
 $\frac{17}{12} = (1 + \frac{.05}{12})^x$

$\log(1 + \frac{.05}{12})(\frac{17}{12}) = x$
 $\frac{83.76}{12}$

(6.98 years)

② $y = 14,000(1+.07)^x$
 $16,000 = 14,000(1+.07)^x$
 $\frac{16}{14} = 1.07^x$
 $\log_{1.07}(\frac{16}{14}) = x$

$x = 1.97$

④ $y = 18,000(1 + \frac{.05}{4})^x$
 $30,000 = 18,000(1 + \frac{.05}{4})^x$
 $\log(1 + \frac{.05}{4})(\frac{30}{18}) = x$

$\frac{41.12}{4}$ (10.3)