SWBAT: _solve exponential equations_

Using Logs to Solve Exponential Functions

Key

1. Isolate the exponential function
2. Take the common log of both sides
3. Solve for x

---

1. $e^{2x} = 8$

$$2x \ln e = \ln 8$$
$$2x = \frac{\ln 8}{\ln e}$$
$$\boxed{x = 1.04}$$

2. $2e^x = 8$

$$e^x = 4$$
$$x \ln e = \ln 4$$
$$x = \frac{\ln 4}{\ln e} = \frac{\ln 4}{1} = \boxed{1.386}$$

3. $2e^x = 4$

$$e^x = 2$$
$$x \ln e = \ln 2$$
$$x = \ln 2$$
$$\boxed{x = .693}$$

4. $5^{x+1} = 25$

$$x+1(\log 5) = \log 25$$
$$x+1 = \frac{\log 25}{\log 5}$$
$$\boxed{x = 1}$$

5. $5 + 2^{x+6} = 9$

$$2^{x+6} = 4$$
$$x + 6(\log 2) = \log 4$$
$$\boxed{x = -4}$$

6. $4^x - 5 = 3$

$$4^x = 8$$
$$x \log 4 = \log 8$$
$$x = \frac{\log 8}{\log 4} = \boxed{1.5} \text{ or } \boxed{\frac{3}{2}}$$

7. $e^{3x} = 124$

$$3x \ln e = \ln 124$$
$$3x = \ln 124$$
$$\boxed{x = 1.607}$$

8. $12e^{3x-2} = 8$

$$e^{3x-2} = \frac{8}{12}$$
$$3x - 2(\ln e) = \ln\left(\frac{8}{12}\right)$$
$$3x - 2 = \ln\left(\frac{8}{12}\right)$$
$$\boxed{x = .532}$$

9. $4^{3x} + 2 = 3$

$$4^{3x} = 1$$
$$3x(\log 4) = \log 1$$
$$\boxed{x = 0}$$

10. $2^{3x} - 2 = 13$

$$2^{3x} = 15$$
$$3x(\log 2) = \log 15$$
$$\boxed{x = 1.302}$$

11. $5^{2x+7} - 1 = 8$

$$5^{2x+7} = 9$$
$$2x + 7(\log 5) = \log 9$$
$$2x + 7 = 1.365$$
$$\boxed{x = -2.817}$$

12. $7 - 2^{x+7} = 5$

$$-2^{x+7} = -2$$
$$2^{x+7} = 2$$
$$(x+7)(\log 2) = \log 2$$
$$x + 7 = 1$$
$$\boxed{x = -6}$$

Solve Exponential Equations Using a Calculator

1. Set the equation equal to zero
2. Graph in Y=
3. Find the zeros!

or

① Type left in y_1
② Type right in y_2
③ 2nd trace intersect

13. $7 - 5^{2x-1} = 4$	14. $4e^{2x} = 5$
$X = .841$	$X = .112$
15. $5^x + 4 = 8$	16. $3^{(x+8)} = 12$
$X = .861$	$X = -5.738$

Reminder: Change of Base Formula

$$\log_m n = \frac{\log n}{\log m}$$

Evaluate using the change of base formula – round to 2 decimal places.

17. $\log_2 7$	18. $\log_7 75$
$= \frac{\log 7}{\log 2} \approx \boxed{2.81}$	$= \frac{\log 75}{\log 7}$ $= \boxed{2.22}$
19. $\log_5(1/10)$	20. $\log_{2.9} 7.5$
$\frac{\log(\frac{1}{10})}{\log 5} = \boxed{-1.43}$	$\frac{\log 7.5}{\log 2.9} = \boxed{1.89}$