

Solve exponential use logs

Solve log use exponentials

7.7 Base e and Natural Logarithms

Honors Algebra 2

1. Solve the following equations:

a.  $4^x = 19$

$$\log_4 4^x = \log_4 19$$

$$x = \log_4 19 \\ = 2.1239$$

b.  $6^x = 40$

$$\log_6 6^x = \log_6 40$$

$$x = \log_6 40 \\ = 2.0588$$

c.  $2^{a+2} = 9$

$$\log_2 2^{a+2} = \log_2 9$$

$$a+2 = \log_2 9$$

$$a = -2 + \log_2 9$$

d.  $11^{b-3} = 5^b$   $= 1.1699$

$$\log_{11} 11^{b-3} = \log_{11} 5^b$$

\* exponent drops in front as coefficient

$$b-3 = b \log_{11} 5$$

$$b - b \log_{11} 5 = 3$$

$$b(1 - \log_{11} 5) = 3 \quad b = \frac{3}{1 - \log_{11} 5}$$

\* GCF is b

$$b. \ln 40 + 2 \ln \frac{1}{2} + \ln x \\ = \ln 40 + \ln (\frac{1}{2})^2 + \ln x \quad = 9.1238$$

$$= \ln 40 (\frac{1}{2})^2 x$$

$$= \ln 40 (\frac{1}{4}) x$$

$$= \ln 10x$$

b.  $3e^{4x} - 12 = 15$

$$3e^{4x} = 27$$

$$e^{4x} = 9$$

$$\ln e^{4x} = \ln 9$$

$$4x = \ln 9$$

$$x = \frac{1}{4} \ln 9$$

$$= 0.5493$$

2. Condense the following:

a.  $3 \ln 10 - \ln 8$

$$= \ln 10^3 - \ln 8$$

$$= \ln \frac{10^3}{8}$$

$$= \ln 125$$

3. Solve the following equations:

a.  $4e^{-2x} - 5 = 3$

$$4e^{-2x} = 8$$

$$e^{-2x} = 2$$

$$\ln e^{-2x} = \ln 2$$

$$-2x = \ln 2$$

$$x = -\frac{1}{2} \ln 2$$

$$= -0.3466$$

\*  $\ln x = \log_e x$

\* isolate exponential

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Honors Algebra 2

c.  $4e^{-x} + 8 = 17$

$$4e^{-x} = 9$$

$$e^{-x} = 9/4$$

$$\ln e^{-x} = \ln 9/4$$

$$-x = \ln 9/4$$

$$x = -\ln 9/4$$

$$= -0.8109$$

d.  $5e^x - 24 = 16$

$$5e^x = 30$$

$$e^x = 6$$

$$\ln e^x = \ln 6$$

$$x = \ln 6$$

$$x = 1.7918$$

e.  $3\ln 4x = 24$

$$\ln 4x = 8$$

$$e^8 = 4x$$

$$\frac{1}{4} e^8 = x$$

f.  $5\ln 6x = 8$

$$\ln 6x = 8/5$$

$$e^{8/5} = 6x$$

$$\frac{1}{6} e^{8/5} = x$$

\* rewrite as  
exponential

remember

$$\ln 6x = \log_e 6x$$

g.  $-4\ln 2x = -26$

$$\ln 2x = 4$$

$$e^4 = 2x$$

$$\frac{1}{2} e^4 = x$$

h.  $\ln 3x = 8$

$$e^8 = 3x$$

$$\frac{1}{3} e^8 = x$$