

Equations Requiring LN:

1. Isolate the base with its exponent
2. Rewrite into log form
3. Solve by using LN

$$\text{natural log} = \boxed{\log_e} x = \boxed{\ln} (x)$$

EXAMPLE 9:

$$e^{6m} = 48$$

$$\log_e 48 = 6m$$

$$\ln(48) = 6m$$

$$\frac{3.8712}{6} = \frac{6m}{6}$$

$$0.6452 = m$$

only use
ln when
base is 'e'

Example 10:

$$\frac{6e^{a+2.7}}{6} = \frac{47}{6}$$

$$e^{a+2.7} = 7.8\bar{3}$$

$$\log_e 7.833 = a+2.7$$

$$\ln(7.833) = a+2.7$$

$$2.0583 = a+2.7$$

$$\underline{-2.7} \quad \underline{-2.7}$$

$$-0.6416 = a$$

EXAMPLE 11:

$$e^{-7x-2} - 7 = 62$$

$$\underline{+7} \quad \underline{+7}$$

$$e^{-7x-2} = 69$$

$$\log_e 69 = -7x-2$$

$$\ln(69) = -7x-2$$

$$4.2341 = -7x-2$$

$$\underline{+2} \quad \underline{+2}$$

$$6.2341 = -7x$$

$$\underline{-7} \quad \underline{-7}$$

$$-0.8906 = x$$

Example 12:

$$4e^{0.8n+5} + 6 = 104$$

$$\underline{-6} \quad \underline{-6}$$

$$\frac{4e^{0.8n+5}}{4} = \frac{98}{4}$$

$$e^{0.8n+5} = 24.5$$

$$\log_e 24.5 = 0.8n+5$$

$$\ln(24.5) = 0.8n+5$$

$$3.1987 = 0.8n+5$$

$$\underline{-1.8013} = 0.8n$$

$$n = -2.2517$$

Equations Requiring LN

Exponential Equations with LN - HW

Solve each equation. Round your answers to the nearest ten-thousandth.

1) $e^r = 54$

$\log_e 54 = r$

$\ln 54 = r$

$3.9890 = r$

2) $e^x = 48.9$

3) $e^n = 7$

4) $e^x = 30.5$

$\log_e 30.5 = x$

$\ln(30.5) = x$

$3.4177 = x$

5) $e^{x-6} = 10$

6) $e^{7x} = 53$

$\log_e 53 = 7x$

$\ln(53) = 7x$

$\frac{3.9703}{7} = \frac{7x}{7}$

$0.5672 = x$

7) $e^{-4x} = 22$

8) $e^{b+9} = 77$

$\log_e 77 = b+9$

$\ln(77) = b+9$

$4.3438 = b+9$

$-4.6562 = b$

9) $4e^{8n} = -15$

$e^{8n} = \frac{15}{4}$

$\log_e \left(\frac{15}{4}\right) = 8n$

$\ln\left(\frac{15}{4}\right) = 8n$

$1.3218 = 8n$

$0.1652 = n$

10) $e^{x+9} - 4 = 23$

$e^{x+9} = 27$

$\log_e 27 = x+9$

$\ln(27) = x+9$

$3.2958 = x+9$

$-5.7042 = x$

$$11) e^{n-10} + 9 = 20$$

$$13) e^{-9n-2} + 7 = 88$$

$$\begin{aligned} 15) -6e^{10x+8} &= -20 \\ e^{10x+8} &= \frac{-20}{-6} \\ \log_e \frac{20}{6} &= 10x+8 \\ \ln\left(\frac{20}{6}\right) &= 10x+8 \\ 1.2040 &= 10x+8 \\ -6.7960 &= 10x \\ -0.6796 &= x \\ 17) e^{5-4b} + 4 &= 43 \end{aligned}$$

$$19) e^{-7b-9} - 5 = 72.4$$

$$\begin{aligned} 12) e^{p-10} + 3 &= 57 \\ e^{p-10} &= 54 \end{aligned}$$

$$\begin{aligned} \log_e 54 &= p-10 \\ \ln(54) &= p-10 \\ 3.9890 &= p-10 \\ 13.9890 &= p \end{aligned}$$

$$\begin{aligned} 14) 4e^{2b+9} &= 39 \\ e^{2b+9} &= \frac{39}{4} \end{aligned}$$

$$\begin{aligned} \log_e \frac{39}{4} &= 2b+9 \\ \ln\left(\frac{39}{4}\right) &= 2b+9 \\ 2.2773 &= 2b+9 \\ -6.7227 &= 2b \\ -3.3614 &= b \end{aligned}$$

$$\begin{aligned} 16) 3e^{2.1b-8} &= 42 \\ e^{2.1b-8} &= 14 \end{aligned}$$

$$\begin{aligned} \log_e 14 &= 2.1b-8 \\ \ln 14 &= 2.1b-8 \\ 2.6391 &= 2.1b-8 \\ 10.6391 &= 2.1b \\ 5.0662 &= b \end{aligned}$$

$$18) -5e^{5-p} = -15$$

$$\begin{aligned} e^{5-p} &= 3 \\ \log_e 3 &= 5-p \\ \ln(3) &= 5-p \\ 1.0986 &= 5-p \\ -3.9014 &= -p \end{aligned}$$

$$3.9014 = p$$

$$\begin{aligned} 20) -7e^{6v-6} &= -14 \\ e^{6v-6} &= 2 \end{aligned}$$

$$\begin{aligned} \log_e 2 &= 6v-6 \\ \ln(2) &= 6v-6 \\ 0.6931 &= 6v-6 \\ 6.6931 &= 6v \\ 1.1155 &= v \end{aligned}$$

$$6.6931 = 6v$$

$$1.1155 = v$$