

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:

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

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

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

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

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

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

$$3.1987 = 0.8n+5$$

$$\underline{-5} \quad \underline{-5}$$

$$-1.8013 = 0.8n$$

$$n = -2.2517$$

Equations Requiring LN

Tuesday

Algebra 2 w/Support

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Name _____

Date _____ Period _____

More Applications Practice

- 1) Alberto invests \$1,653 in a retirement account with a fixed annual interest rate of 7% compounded semi-annually. What will the account balance be after 15 years?

$$A = A$$

$$P = 1635$$

$$r = 0.07$$

$$n = 2$$

$$t = 15$$

$$A = 1635 \left(1 + \frac{0.07}{2}\right)^{30}$$

$$A = \$4589.11$$

- 2) Bill invests \$3,120 in a savings account with a fixed annual interest rate of 6% compounded continuously. What will the account balance be after 8 years?

$$A = A$$

$$P = 3,120$$

$$r = 0.06$$

$$t = 8$$

$$A = 3120 e^{(0.06)(8)}$$

$$A = \$5042.15$$

- 3) Jessica invests a sum of money in a savings account with a fixed annual interest rate of 9% compounded monthly. After 7 years, the balance reaches \$14,953.77. What was the amount of the initial investment?

$$A = 14,953.77$$

$$P = P$$

$$r = 0.09$$

$$n = 12$$

$$t = 7$$

$$14,953.77 = P \left(1 + \frac{0.09}{12}\right)^{84}$$

$$14,953.77 = P(1.87)$$

$$\$7983.00 = P$$

- 4) Jennifer invests a sum of money in a savings account with a fixed annual interest rate of 2% compounded continuously. After 5 years, the balance reaches \$7,475.38. What was the amount of the initial investment?

$$A = 7,475.38$$

$$P = P$$

$$r = 0.02$$

$$t = 5$$

$$7,475.38 = P e^{(0.02)(5)}$$

$$7,475.38 = P(1.105)$$

$$\$6764.00 = P$$

- 5) Elisa invests \$4,347 in a retirement account with a fixed annual interest rate of 8.78% compounded continuously. What will the account balance be after 19 years?

$$A = 4,347 e^{(0.0878)(19)}$$

$$P = 4,347$$

$$r = 0.0878$$

$$t = 19$$

$$A = \$23,050.47$$

- 6) Kayla invests \$6,209 in a savings account with a fixed annual interest rate of 3% compounded continuously. How long will it take for the account balance to reach \$7,893.19?

$$A = 7893.19$$

$$P = 6209$$

$$r = 0.03$$

$$t = t$$

$$7893.19 = 6209 e^{0.03t}$$

$$1.27 = e^{0.03t}$$

$$\ln(1.27) = 0.03t$$

$$8 = t$$

- 7) Pranav invests \$7,163 in a savings account with a fixed annual interest rate of 5.50% compounded quarterly. How long will it take for the account balance to reach \$9,941.13?

$$A = 9,941.13$$

$$P = 7,163$$

$$r = 0.055$$

$$n = 4$$

$$t = t$$

$$9,941.13 = 7,163 \left(1 + \frac{0.055}{4}\right)^{4t}$$

$$1.39 = (1.01375)^{4t}$$

$$\frac{\log(1.39)}{\log(1.01375)} = 4t$$

$$24 = 4t$$

$$t = 6$$

- 8) Mike invests \$6,897 in a retirement account with a fixed annual interest rate compounded monthly. After 16 years, the balance reaches \$24,700.88. What is the interest rate of the account?

$$24,700.88 = 6897 \left(1 + \frac{r}{12}\right)^{192}$$

$$\sqrt[192]{3.58} = 1 + \frac{r}{12}$$

$$1.0066 = 1 + \frac{r}{12}$$

$$0.0066 = \frac{r}{12}$$

$$0.08 = r$$

- 9) Maria invests a sum of money in a retirement account with a fixed annual interest rate of 5% compounded continuously. After 19 years, the balance reaches \$17,011.38. What was the amount of the initial investment?

$$A = 17,011.38$$

$$P = P$$

$$r = 0.05$$

$$t = 19$$

$$17011.38 = P e^{(0.05)(19)}$$

$$17011.38 = P(2.59)$$

$$\$6579.00 = P$$

- 10) Chelsea invests \$5,216 in a savings account with a fixed annual interest rate compounded continuously. After 5 years, the balance reaches \$5,764.57. What is the interest rate of the account?

$$A = 5764.57$$

$$P = 5216$$

$$r = r$$

$$t = 5$$

$$5764.57 = 5216 e^{5r}$$

$$1.11 = e^{5r}$$

$$\ln(1.11) = 5r$$

$$0.10 = 5r$$

$$0.02 = r$$