4.6 Solving Log & Exponential Equations - Mixed Practice & Finding Inverses
4.7 Exponential Word Problems - Compound Interest

Solve. Round to three decimal places if necessary.

If $f(x) = \log(x + 3)$, find $f^{-1}(2)$

$$2 = \log(x + 3)$$

$$10 \qquad 10$$

$$100 = x + 3$$

Two Types

       1. Compound Interest

       2. Growth/ Decay Models

Compound Interest

For interest compounded n times per year:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Where:

A   Accumulated amount

P   Principal

r   rate (as a decimal)

n   number of times compounded per year

t   time (years)

	n
Annually	1
Quarterly	4
Monthly	12
Weekly	52
Daily	365
Semiannually	2
~~Bimonthly~~	

Compound Interest

For interest compounded <u>continuously</u>:

$$A = Pe^{rt}$$

Where:

A Accumulated amount

P Principal

r rate (as a decimal)

t time (in years)

ex 1: Find the total value of a $7,300 investment it is invested at 7% annual interest compounded semiannually for 3 years.

t

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$A = 7300\left(1 + \frac{.07}{2}\right)^{6}$$

$$A = 8973.56$$

ex 2: Find the total value of a $7,300 investment it is invested at 7% annual interest compounded continuously for 3 years.

$$A = 7300e^{.07(3)}$$

$$= 9005.85$$

ex 3: Find the total value of a $1.17 investment it is invested at 9% annual interest compounded daily since 1927.

$$A = 1.17 \left(1 + \frac{.09}{365}\right)^{365 \cdot 92}$$

$$A = \$4610$$

ex 3: ABC Bank is offering to double your money! They say that if you invest with them at 6% interest compounded continuously they will double your money. If you invest $1500 in the account, how long will it take to double your money.

$$3000 = 1500e^{.06t}$$

$$\ln 2 = \cancel{\ln} e^{.06t} \qquad t = \frac{\ln 2}{.06}$$

$$\ln 2 = .06t \qquad\qquad = 11.55 \text{ years}$$

ex 5: An investment of $7,000 becomes $10,000 when invested for 5 years in a bank that compounds interest quarterly. What interest rate does the bank use?

Round the interest rate to the nearest tenth.

$$10,000 = 7000\left(1 + \frac{r}{4}\right)^{20}$$

$$\left(\frac{10}{7}\right)^{1/20} = \left(\left(1 + \frac{r}{4}\right)^{20}\right)^{1/20}$$

$$1/20 = .05$$

$$1.017993718 = 1 + \frac{r}{4}$$

$$.07197 = r$$

$$\boxed{\begin{array}{l} 7.197 \\ 7.2\% \end{array}}$$

9. $e^{\ln\sqrt{x+5}} = e^3$

$$\left(\sqrt{x+5}\right)^2 = \left(e^3\right)^2$$

$$x+5 = e^6$$

$$x = e^6 - 5 = 398.429$$

12.) $\log 3^{x+1} = \log 5^{x-3}$

$(x+1)\log 3 = (x-3)\log 5$

$x\log 3 + \log 3 = x\log 5 - 3\log 5$

$x\log 3 - x\log 5 = -\log 3 - 3\log 5$

$$X = \frac{-\log 3 - 3\overset{\log 125}{\cancel{\log 5}}}{\log 3 - \log 5} = \frac{-(\log 375)}{\log \frac{3}{5}}$$