$\$200{,}000 = A_0$

rate = 9% $\longrightarrow$ 0.09

time: 15 years

compounded monthly

$n = 12$

$$A = A_0\left(1 + \frac{r}{n}\right)^{nt}$$

$$\downarrow$$

$$200{,}000\left(1 + \frac{0.09}{12}\right)^{(12)(15)}$$

$$\boxed{\$767{,}608.65}$$

Continuous Compounding $A = Pe^{rt}$

$P = \$96{,}000$

rate = 3.5%

t = 30 years

$$\downarrow$$

$$96{,}000\, e^{(0.035)(30)}$$

$$\boxed{\$274{,}334.50}$$

=

Logarithm is an exponent

$\log_{10} 10{,}000 = \boxed{x}$ ← exponent

base: 10

$10^x = 10{,}000$

$10^4 = 10{,}000$

$\log_{10} 10{,}000 = 4$

Logarithmic Form

$\log_2 64 = x$ ← exponent

base: 2

$\left[\log_3 81 = x \right]$

Exponential form

$2^x = 64$

$2^6 = 64$

$\log_2 64 = 6$

$3^x = 81$

$3^4 = 81$

$\log_3 81 = \boxed{4}$

Exponential form Logarithmic

$2^x = 32$ $\log_2 32 = x$

$4^{\boxed{9}} = x$ $\log_4 x = \boxed{9}$

$\log_a 20 = b \rightleftharpoons a^b = 20$

$\log_{\boxed{10}} 100 = \log_{10} 100 = 2$

$10^2 = 100$

$\boxed{\log_e a} = x$ $e^x = a$

$\ln a = x$

"natural log"

natural number

$\log_5 \frac{1}{125} = x$

$5^x = \frac{1}{125}$ $5^x = 5^{-3}$

$5^x = \frac{1}{5^3}$ $\boxed{x = -3}$

$\log_a 19 = \frac{1}{2}$ $\quad a^{\frac{1}{2}} = 19$

$(\sqrt{a})^2 = (19)^2$

$\boxed{a = 361}$

$\log_9 y = 81$ $\quad \boxed{9^{81} = y}$

1.) $\log_2 \frac{1}{8} = x$ $\quad 2^x = \frac{1}{8}$ $\quad 2^x = 2^{-3}$ $\quad \boxed{x = -3}$

2.) $\log_3 27 = x$ $\quad 3^x = 27$ $\quad 3^x = 3^3$ $\quad \boxed{x = 3}$

3.) $\log_6 \frac{1}{216} = x$ $\quad 6^x = \frac{1}{216}$ $\quad 6^x = 6^{-3}$ $\quad \boxed{x = -3}$

4.) $\log_a a^{12} = x$ $\quad a^x = a^{12}$ $\quad \boxed{x = 12}$

Change of Base

$\log_8 27 = x$

$8^x = 27$

$\log(8^x) = (27)\log$

$x \log 8 = \log 27$

$\frac{x(\log 8)}{\log 8} = \frac{\log 27}{\log 8}$

$x = \boxed{\frac{\log 27}{\log 8}}$

Proof

$\log_2 16^2 =$

$\log_2 16^2 = 2(\log_2 16)$

$\log_2 (2^4)^2 = 2(\log_2 2^4)$

$\log_2 2^8 = 2(4)$

$8 = 8$ ✓

$\log_2 76 = x$

$\log(2^x) = (76)\log$

$x \log 2 = \log 76$

$\frac{x \log 2}{\log 2} = \frac{\log 76}{\log 2}$

$x = \frac{\log 76}{\log 2}$

$\log_{\square} 8 = \log_{10} 8 = X$

$\log(10^X) = (8)\log$

$\log 10^X = \log 8$

$\frac{X \log 10}{\log 10} = \frac{\log 8}{\log 10}$

$X = \frac{\log 8}{\log 10}$

$\ln(e^X) = (64)\ln$

$\ln e^X = \ln 64$

$X = \ln 64$

$\ln e^X$

$\log_{\cancel{e}} e^X = y$

$e^y = e^{(X)}$

X

$e^x =$ 

$x = \ln$ 

$\ln e^x = \ln 5$

$x = \ln 5$

$e^x = 128$

$x = \ln 128$