Solve. $\log_5 x = 4$

$5^4 = x$

$625 = x$

Solve. $\log_x 80 = 3$

$\sqrt[3]{x^3} = \sqrt[3]{80}$

$x = 4.31$

Solve: $4^x = 100$

$\log_4 100 = x$

Change of Base Formula:

Property	Change of Base Formula

For any positive numbers, M, b, and c, with $b \neq 1$ and $c \neq 1$,

$$\log_b M = \frac{\log_c M}{\log_c b} = \frac{\log_{10} M}{\log_{10} b} = \frac{\log M}{\log b}$$

$\log_4 100 = x$

$$\frac{\log 100}{\log 4} = x$$

$3.32 = x$

Find each.

1. $\log_5 8$

$\frac{\log 8}{\log 5} = 1.29$

2. $\log_3 100$

$\frac{\log 100}{\log 3} = 4.19$

Solve: $7^x = 60$

$\log_7 60 = x$

$2.10 = \frac{\log 60}{\log 7} = x$

Solve: $20(3)^x = 450$

$\frac{20}{20} \quad \frac{}{20}$

$3^x = 22.5$

$\log_3 22.5 = x$

$\frac{\log 22.5}{\log 3} = 2.83$

Solve. $35 - 4^x = 17$

$-35 \qquad -35$

$\frac{-4^x}{-1} = \frac{-18}{-1}$

$4^x = 18$

$\log_4 18 = x$

$\frac{\log 18}{\log 4} = x \rightarrow 2.08$

Solve: $16(3)^{x+1} = 80$

$\frac{16}{16} \quad \frac{16}{16}$

$3^{x+1} = 5$

$\log_3 5 = x+1$

$-1 \quad -1$

$\frac{\log 5}{\log 3} - 1$

$0.46 = x$

Solve: $\log_9(2x-1) = 3$

$9^3 = 2x-1$

$729 = 2x-1$

$+1 \quad +1$

$\frac{730}{2} = \frac{2x}{2}$

$365 = x$

The value of a house has been decreasing 7.5% each year. The house was worth $180,000 in 2001.

$100 - 7.5 = 92.5$

$b = .925$

In how many years will the value first fall below $45,000?

$45{,}000 = 180{,}000(0.925)^x$

$\frac{45{,}000}{180{,}000} \quad \frac{180{,}000}{180{,}000}$

$.25 = .925^x$

$\log_{.925} .25 = x$

$\frac{\log .25}{\log .925} = x$

17.78 yrs

You invest $20,000 in an account that pays 9% annual interest.

How many years, to the nearest hundredth, will it take to double your investment?

$100 + 9 = 109\%$

$\frac{20{,}000}{20{,}000}(1.09)^x = \frac{40{,}000}{20{,}000}$

$1.09^x = 2$

$\log_{1.09} 2 = x$

$\frac{\log 2}{\log 1.09} = x =$ 8.04 yrs

The population of a city in 2005 was 342,700. The population has been increasing 3.92% each year. In how many years, rounded to the nearest hundredth, will the population reach 1,000,000?

$100 + 3.92$

103.92%

$$\frac{342{,}700(1.0392)^x}{342{,}700} = \frac{1{,}000{,}000}{342{,}700}$$

$$1.0392^x = \frac{1{,}000{,}000}{342{,}700}$$

$$\log_{1.0392}\left(\frac{1{,}000{,}000}{342{,}700}\right)$$

$x = 27.85$

You can now finish Hwk #35.

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Problems 3, 4, 10, 11, 23, 24, 30, 31, 37, 40