MTH-PT Trigonometry Session 2 1/29

$6^{\frac{1}{2}}$ root $= \pm\sqrt{6}$

exponent

$81^{3/2}$ root $= \left(\sqrt{81}\right)^{3} = \left(\pm 9\right)^{3}$

$\boxed{\pm 729}$

<u>Change the base</u>

$36^{k-3} = 216^{3k}$

$\left(6^{2}\right)^{k-3} = \left(6^{3}\right)^{3k}$

$6^{\textcolor{red}{2(k-3)}} = 6^{\textcolor{blue}{9k}}$

$\underline{6}^{\boxed{2k-6}} = \underline{6}^{\boxed{9k}}$

$2k - 6 = 9k$

$\textcolor{purple}{-2k} \qquad \textcolor{purple}{-2k}$

$\dfrac{-6}{7} = \dfrac{7k}{7}$

$\boxed{k = \dfrac{-6}{7}}$

$64^{3k-2} = 16^{-3k}$

$\left(4^{3}\right)^{3k-2} = \left(4^{2}\right)^{-3k}$

$\underline{4}^{\boxed{9k-6}} = \underline{4}^{\boxed{-6k}}$

$9k - 6 = -6k$

$-9k \qquad -9k$

$\dfrac{-6}{-15} = \dfrac{-15k}{-15}$

$k = \dfrac{-6 \div -3}{-15 \div -3} = \boxed{\dfrac{2}{5}}$

Graphing Exponents

$y = ab^{x}$ ← exponent

↑ "slope"/ amplitude

$y = \frac{1}{3}\left(\frac{1}{2}\right)^{x}$

$x = 0$

$x = 1$

$y = ab^{(x-h)} + k$

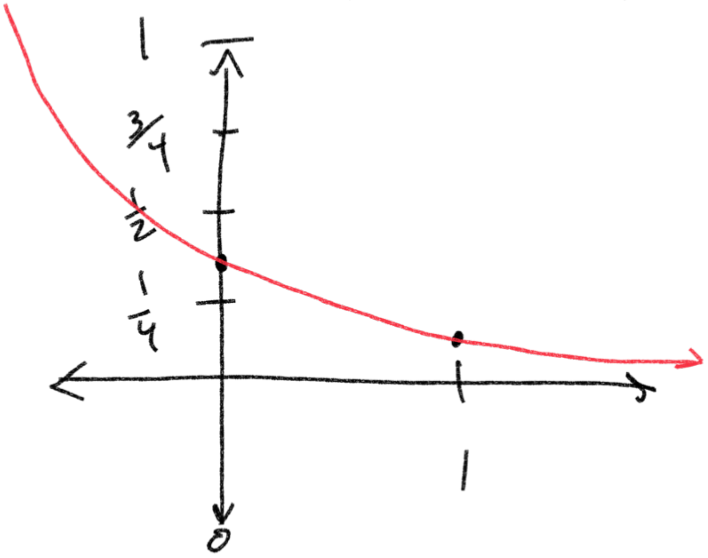
$y = \frac{1}{3}\left(\frac{1}{2}\right)^{0} = \frac{1}{3}$

$(0, \frac{1}{3})$

$y = \frac{1}{3}\left(\frac{1}{2}\right)^{1} = \frac{1}{6}$

$(1, \frac{1}{6})$

(h, k) → translation



$y = \frac{1}{3}\left(\frac{1}{2}\right)^{x}$

↑ base

base < 1
decreasing

base > 1
increasing

1.) $y = 5\left(\frac{1}{4}\right)^x$

increasing [✓ decreasing]

$x = 0$ $y = 5\left(\frac{1}{4}\right)^0 = 5$

$(0, 5)$

$x = 1$ $y = \frac{5}{1}\left(\frac{1}{4}\right)^1 = \frac{5}{4}$

$(1, \frac{5}{4})$

2.) $y = \frac{1}{3}(2)^x$

[✓ increasing] decreasing

$x = 0$ $y = \frac{1}{3}$

$x = 1$ $y = \frac{2}{3}$

Compound Interest

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

A = total amount

A_0 = initial amount

r = rate (decimal)

n = compound frequency

monthly = 12 daily = 365 quarterly = 4

t = time (years)

$A_0 = \$2,000$

$r = 8\%$

compound semi-annually

$n = 2$

$t = 6$ years

$A = 2000\left(1 + \frac{0.08}{2}\right)^{(2)(6)}$

$2000\left(1 + \frac{0.08}{2}\right)^{12}$

\$3,202.06

$A = A_0\left(1+\frac{r}{n}\right)^{nt}$ $112,000 $t = 1$

$r = 5\%$

ⓐ compounded yearly

$n = 1$

$112{,}000\left(1+\frac{0.05}{1}\right)^{1} = \$117{,}600$

ⓑ semi-annually

$112{,}000\left(1+\frac{0.05}{2}\right)^{(2)(1)} = \$117{,}670$

$n = 2$

ⓒ monthly

$112{,}000\left(1+\frac{0.05}{12}\right)^{12(1)} = \$117{,}730.10$

$n = 12$

ⓓ daily

$112{,}000\left(1+\frac{0.05}{365}\right)^{365(1)} = \$117{,}741.96$

$n = 365$

compounded continuously

$n = \infty$

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

$\lim_{n\to\infty}$

$\lim_{n\to\infty} \left(1+\frac{1}{n}\right)^{n} = 2.7172\ldots = e$

natural number

Continuous Compounded Interest

$A = Pe^{rt}$

P = principal or initial amount

e (natural number)

r = rate (decimal)

t = time (years)

P = \$112,000

r = 5%

t = 1

$A = 112{,}000 e^{0.05(1)} = 117{,}742.36$

Initial amount = \$8,615

r = 2%

comp. continuously

t = 11 years

$A = Pe^{rt}$

$(8{,}615)e^{(0.02)(11)}$

$\boxed{\$10{,}734.95}$

\$500,000   Goal = \$10,000,000

$r = 6\%$ $t = ?$

$$\frac{10,000,000}{500,000} = \frac{500,000\,e^{0.06t}}{500,000}$$

$$20 = e^{0.06t}$$