$f(x) = x^2 \quad f(x) = x^3 \quad f(x) = \sqrt{x} = x^{\frac{1}{2}} \quad f(x) = \frac{1}{x} = x^{-1}$

The exponential function $f(x)$ with base a is written:

$$f(x) = \underset{\text{base \#}}{a}^{x \leftarrow \text{variable in exponent}}$$

ex $f(x) = 5^{2x-3} + 8$

$f(2) = \underline{13}$

$5^{2(2)-3} + 8$

$5^1 + 8$

$f(1) = \frac{41}{5}$ OR 8.2

$5^{2(1)-3} + 8$

$5^{-1} + 8$

$\frac{1}{5} + 8$

ex Solve for x.

$4^{2x+1} = 4^3$ — base #'s match

$2x + 1 = 3$

$-1 \quad -1$

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

$\boxed{x = 1}$

$x = -2$

$3^{x+4} = 9$ — base #'s do not match

$3^{x+4} = 3^2$ — base #'s match

$x + 4 = 2$

$-4 \quad -4$

$\boxed{x = -2}$

$2^{x^2+5} = 2^{-6x}$ — base #'s match

$x^2 + 5 = -6x$

$+6x \quad +6x$

$x^2 + 6x + 5 = 0$

$(x+1)(x+5) = 0$

$\boxed{x = -1}$ $\boxed{x = -5}$

$\pi \approx 3.14159...$

$i = \sqrt{-1}$

$e \approx 2.7183...$

↳ The Natural Base

Bank Accounts:

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

↳ compounding interest n-times per year

$A = P \cdot e^{r \cdot t}$

↳ compounding interest continuously

A = Balance in account (how much \$ is in account)

P = Principal (how much \$ you start with in the scenario)

t = amount of time in years

ex 2 years: $t = 2$; 5 years: $t = 5$; 10 months: $t = \frac{10}{12} = \frac{5}{6}$; 6 months: $t = \frac{6}{12} = \frac{1}{2}$; 10 weeks: $t = \frac{10}{52} = \frac{5}{26}$

r = interest rate in decimal form

ex 16%: $r = 0.16$; 5%: $r = 0.05$; 9.4%: $r = 0.094$

n = # of times interest is calculated (compounded) per year

ex Monthly $n = 12$; Weekly $n = 52$; Daily $n = 365$; Annually $n = 1$; Quarterly $n = 4$

ex \$12,000 → P = \$12,000

9% → r = 0.09

5 years → t = 5

$n = 12$

Monthly vs. Continuously

Monthly:

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

$A = \$12{,}000\left(1 + \frac{0.09}{12}\right)^{12 \cdot 5}$

$(1.0075)^{60}$

$\boxed{A = \$18{,}788.17}$

\$6,788.17

Continuously:

$A = Pe^{rt}$

$A = \$12{,}000 \cdot e^{0.09 \cdot 5}$

$\boxed{A = \$18{,}819.75}$

\$6,819.75

\$31.76 more