Exponential/Log and Interest Rate Formulae

Exponential $a \neq 0$	**Logarithmic** $a > 0$
$a^0 = 1$	$\log_a 1 = 0$
$a^1 = a$	$\log_a a = 1$
$1^r = 1, r \in \mathbb{R}$	$\log_a (a^x) = x$
$a^{(x+y)} = (a^x)(a^y)$	$\log_a xy = log_a x + \log_a y$
$a^{x-y} = \frac{a^x}{a^y}$	$\log_a \frac{x}{y} = \log_a x - \log_a y$
$(a^x)^r = a^{xr}$	$\log_a (a^p) = p \log_a (a), p \in \mathbb{R}$
	$a^{\log_a x} = x$
$a^x = b^{x \cdot \log_b a}$	$\log_a x = \frac{\log_b x}{\log_b a}$

- r = annual interest rate, without considering compounding
- n = number of periods per year that interest is paid (compounding factor, e.g. compounding "semi-annually" means $n = 2$)
- t = number of years of the investment
- P = present value
- F = future value
- r^* = effective interest rate (i.e. the annual interest rate if considering the interest rate is calculated annually)

$$F = P(1 + \frac{r}{n})^{nt} = P(1 + r^*)$$

$$P = F(1 + \frac{r}{n})^{-nt}$$

If the interest is compounding continuously, i.e. $n \to \infty$,

$$F = Pe^{rt}; \quad P = Fe^{-rt}$$