Basic Logarithmic Properties

1. $\log_a(xy) = \log_a(x) + \log_a(y)$
2. $\log_a \frac{x}{y} = \log_a(x) - \log_a(y)$
3. $\log_a(x^r) = r \log_a x$
4. $\log_a(x^r) = r \log_a x$ *(notice the* $\log_a$ *and the a cancel)*
5. $\log_a(1) = 0$
6. $\log_a \frac{1}{x} = -\log_a(x)$
7. $\log_a(x) = \frac{\ln(x)}{\ln a}$
8. $\ln(e^y) = y$ *(notice the* ln *and the a cancel)*

Probability

1. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
2. $P(A \cap B) =$
   $P(A)P(B)$ *When A&B are independent*
3. $P(A|B) = \frac{P(B|A)\,P(A)}{P(B|A)P(A)+P(B|A')P(A')}$
4. $P(A) + P(A') = 1$
5. $P(A \cap B) = 0$ *When A & B are exclusive*

Properties of Quadratic Equations

$y = ax^2 + bx + c, \quad vertex = \frac{-b}{2a}$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, $x =$ *zeros of quadratic equation*

Derivative limit Formula

1. $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$
2. $\frac{d}{dx}(x^n) = n\,x^{n-1}$
3. $\int x^n = \frac{x^{n+1}}{n+1}$

Simple Interest

$I = PVrt$

$FV = PV(1 + rt)$

Compound Interest

$i = \frac{r}{m}$

$FV = PV\left(1 + \frac{r}{m}\right)^{mt}$

Sinking Fund

$FV = PMT\left(\frac{(1+i)^n - 1}{i}\right)$

Annuity, withdrawal, mortgage, loan, bonds

$PV = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$

Selling price (bond) $= PMT\left(\frac{1-(1+i)^{-n}}{i}\right) + maturity\,(1+i)^{-n}$

Combination (order doesn't matter)

$C(n,r) = \frac{P(n,r)}{r!} = \frac{n!}{r!\,(n-r)!}$

Permutation

$P(n,r) = \frac{n!}{(n-r)!}$

Probability

$P(E) = \frac{n(E)}{n(S)}$

Factorials

$5! = 5 * 4 * 3 * 2 * 1$ *or*
$5! = 5 * 4 * 3!$ *or*
$5! = 5 * 4!$ *or*

So

$n! = n * (n-1)(n-2)$ *or*
$n! = n * (n-1)!$

Linear formula

$y = mx + b$

$m = \frac{y_2 - y_1}{x_2 - x_1}$; *where* $(x_1, y_1)(x_2, y_2)$

Exponential Formula

$y = ab^x$

$y = Ae^{rt}$; *where* $b = e^r$