## **Useful Formulas:**

## **Summations:**

- Constant series:  $\sum_{i=j}^{k} a = a(k-j+1)$
- Arithmetic series:  $\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$
- Finite Geometric series:  $\sum_{i=0}^{n} r^i = \frac{1-r^{n+1}}{1-r}$

## Logarithms:

- $ln(n) = log_e(n)$
- $log^k(n) = (log(n))^k$
- $log_c(ab) = log_c(a) + log_c(b)$
- $log_c(\frac{a}{b}) = log_c(a) log_c(b)$
- $log_b(a^n) = nlog_b(a)$
- $a^{log_b(c)} = c^{log_b(a)}$
- Logarithmic change of base:  $log_b(a) = \frac{log_c(a)}{log_c(b)}$
- $\frac{d}{dn}ln(n) = \frac{1}{n}$ .
- $\frac{d}{dn}log_b(n) = \frac{1}{n \ ln(b)}$ .