MAC 1140/1147
Sequences Formulas

General Sequence Formulas and Properties

$$\sum_{k=1}^{n} c = cn \qquad \sum_{k=1}^{n} k = \frac{n(n+1)}{2} \qquad \sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{k=1}^{n} k^3 = \left[\frac{n(n+1)}{2}\right]^2 \qquad \sum_{k=j}^{n} a_k = \sum_{k=1}^{n} a_k - \sum_{k=1}^{j-1} a_k \text{, where } 0 < j < n$$

Arithmetic Sequences

n^{th} Term: $a_n = a_1 + (n-1)d$ Recursive: $a_n = a_{n-1} + d$

Sum of the first n Terms: $S_n = \frac{n}{2}(a_1 + a_n)$

Geometric Sequences

n^{th} Term: $a_n = a_1 r^{n-1}$ Recursive: $a_n = r \cdot a_{n-1}$

Sum of the first n Terms of a finite geometric series $\sum_{k=1}^{n} a_1 r^{k-1}$: $a_1 \cdot \frac{1-r^n}{1-r}$

Sum of the terms of a convergent <u>infinite</u> geometric series $\sum_{k=1}^{\infty} a_1 r^{k-1}$: $\frac{a_1}{1-r}$

Binomial Theorem

$$\binom{n}{j} = \frac{n!}{j!(n-j)!} \qquad (x+a)^n = \sum_{j=0}^{n} \binom{n}{j} x^{n-j} a^j$$

In the expansion of $(x+a)^n$, the term containing x^j is: $\binom{n}{n-j} a^{n-j} x^j$