**Colorado Technical University**

**Course:** MATH116 – Foundations for Calculus

## Unit 8 Part 15 Readings: Series

**Series**

A **series** is the sum (or product) of the terms of a sequence

Infinite series vs partial sum

Given a sequence of numbers {an}, the sum of the terms of this sequence:

a1 + a2 + a3 + ... + an + ... is called an infinite series

The sequence Sn defined by:

S1 = a1

S2 = a1 + a2

Sn = a1 + a2 + a3 + ... + an

n

= ∑ ak

k=1

is the sequence of partial sums of the series

The number Sn is the nth partial sum

**Arithmetic series**:

a + (a+d) + (a+d+d) + (a+d+d+d) + …

Σ ark

∞

k=0

form of the series:

### the sum of the first n terms of an arithmetic sequence: Sn = (a1 + an)

an arithmetic series **never converges**: as n tends to infinity, the series will always tend

to positive or negative infinity

**Geometric series**:

a + r×a + r×r×a + r×r×r×a + …

Σ ark

∞

k=0

form of the series:

### the sum of the first n terms of a geometric

### sequence: Sn =

a geometric series **can converge**

(have a limit), but **some diverge**

(as n tends to infinity, the series

does not tend to any limit or it

tends to infinity)

if |x|<1 then the geometric series will

converge to S =

## Fundamental Counting Principle - the number of ways a series of things can occur

## Formula: multiply the number of ways each thing in the series can occur

###### Factorial notation

n**!** = n(n-1)(n-2)...3\*2\*1

Summation Notation Σ ****

means "plug in 1 to 5 for n then add up all five terms"

Properties of Sums



cai = c ai



(ai + bi ) = ai + bi



(ai  bi ) = ai  bi

Graphical user interface

Description automatically generated with medium confidence