9.5 Series

#71

Summation

$$a_1 + a_2 + a_3 + \ldots + a_n$$

(how do we write the sum of long lists of numbers?)

$\sum$ sigma means summation

Summation notation: $\displaystyle\sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + \ldots + a_n$

$$\sum_{k=1}^{5} 3k$$

$$\sum_{k=5}^{8} k^2$$

2+5+8+11+...+29

Sum of a Finite Arithmetic Sequence: #72

$$\sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + \dots + a_n$$

$$= \frac{n(a_1 + a_n)}{2}$$

$$= \frac{n}{2}\left(2a_1 + (n-1)d\right)$$

A theater has 8 seats in the first row. Each successive row has 2 additional seats. The top row has 24 seats. How many seats in a section?

Sum of a Finite Geometric Sequence: #73

$$\sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + \ldots. + a_n$$

$$= \frac{a_1\left(1-r^n\right)}{1-r}$$

Find the sum of:

$$4, \frac{-4}{3}, \frac{4}{9}, \frac{-4}{27}, \ldots.., 4\left(\frac{-1}{3}\right)^{10}$$

3+6+12+....+12,288

Series:

#74

def: sum of the terms in a sequence

sum: usually a total of a finite number of items added together

partial sums: the sums of a specific number of terms in the infinite sequence

(these are used to talk about the infinite series)

as you look at the partial sums, they approach a specific number

$$\lim_{n \to \infty} \sum_{k=1}^{n} a_k = S$$

$$1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \ldots\ldots$$

$S_1 =$

$S_2 =$

$S_3 =$

this is called a converging series

your partial sums could approach ∞ , $-\infty$,
or the limit doesn't exist because the numbers oscillate

$$\lim_{n\to\infty}\sum_{k=1}^{n} a_k = \infty, -\infty, \text{ doesn't exist}$$

3 + 6 + 9 + 12 +...

2 - 2 + 2 - 2 +....

this is called a diverging series

Infinite Geometric Series: #75

$$\sum_{k=1}^{\infty} a \bullet r^{k-1} = S \qquad \text{converges if } |r| < 1$$

it will converge to: $S = \dfrac{a}{1-r}$

a = first term
r = common ratio

Determine if the geometric series converges or diverges.
If it converges, find its sum.

$$\sum_{n=0}^{\infty}\left(-\frac{4}{5}\right)^n$$

$$\sum_{n=1}^{\infty}\left(\frac{\pi}{2}\right)^n$$

$$\sum_{n=0}^{\infty}2\left(\frac{1}{5}\right)^n$$