JANUARY 9

Which of the following sequences converge? How do you know?

$a_n = (-1)^n\left(\dfrac{7n^2}{100n+\pi}\right)$ $a_n = (-1)^n\left(\dfrac{6n^3-5}{20+2n^3}\right)$ $a_n = (-1)^n\left(\dfrac{5n+1}{n^2-2}\right)$

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$$\lim_{n\to\infty}\left|(-1)^n\left(\frac{6n^3-5}{20+2n^3}\right)\right| = 3$$

Diverges

$$\lim_{n\to\infty}\left|(-1)^n\left(\frac{5n+1}{n^2-2}\right)\right| = 0$$

Converges

Absolute Value Theorem

If $\lim_{n\to\infty} |a_n| = 0$

Then $\lim_{n\to\infty} a_n = 0$

If $\lim_{n\to\infty} |a_n| \neq 0$

Then a_n diverges

(if a_n is alternating)

JANUARY 9

Students will verbally explain how to determine if a series converges (using the words: n^{th} term test, partical sum, diverge...)

Series

sum of the terms in a sequence

$$a_1 + a_2 + a_3 + \cdots + a_n + \cdots = \sum_{n=1}^{\infty} a_n$$

expand the series

$$\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$$

$$\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \cdots + \frac{1}{3^n} + \cdots$$

(geometric series)

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$$

$$\frac{(-1)^0}{1} + \frac{(-1)^1}{2} + \frac{(-1)^2}{3} + \frac{(-1)^3}{4} + \cdots + \frac{(-1)^{n-1}}{n} + \cdots$$

$$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \cdots + \frac{(-1)^{n-1}}{n} + \cdots$$

(alternating series)

Partial Sums	sum of a finite series

P_1 = sum of first term

P_2 = sum of the first two terms

$a_1 + a_2$

$\vdots$

P_n = sum of the first n terms

$a_1 + a_2 + \cdots + a_n$

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

find the first five partial sums

$P_1 = \frac{1}{5}$ $= .2$

$P_2 = \frac{1}{5} + \frac{1}{25} = \frac{6}{25}$ $= .24$

$P_3 = \frac{1}{5} + \frac{1}{25} + \frac{1}{125} = \frac{31}{125}$ $= .249$

$P_4 = \frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \frac{1}{625} = \frac{156}{625}$ $= .2496$

$P_5 = \frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \frac{1}{625} + \frac{1}{3125} = \frac{781}{3125}$ $= .24992$

Convergent Series

If the limit of the sequence of Partial Sums exists (limit=L) then the <u>series</u> converges to the value of the limit (L)

Divergent Series

If the limit of the sequence of partial sums does not exist then the <u>series</u> diverges

If $\sum_{n=1}^{\infty} a_n$ converges

then $\lim_{n \to \infty} a_n = 0$

If the <u>series</u> converges

then the <u>sequence</u> converges to 0

n^{th} term test for divergence

(sequence)

If $\lim\limits_{n\to\infty} a_n \neq 0$

then $\sum\limits_{n=1}^{\infty} a_n$ diverges

(series)

Set 2

pg 556 #1-5, 17-37 (odd)