Cornell Notes

Topic/Objective: 6.7 Convergent Series and Sums to infinity

Name:

Class/Period: 4

Date: 4/28/17

Essential Question: What does it mean for a series to be convergent?

Questions:

Sequence:

converging to 4

after 17 4

4

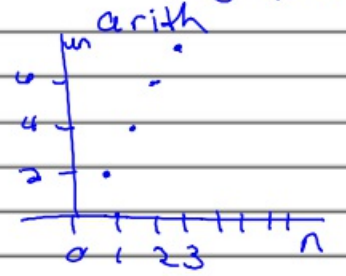
4

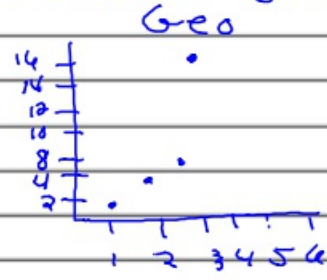
4

Notes:

Sequences and Series can be described by:

- a list of terms
  - 2, 4, 6, 8, ... arithmetic seq
  - 2, 4, 8, 16, ... geo. seq
- a recursive rule
  - $u_{n+1} = u_n + d$ arith
  - $u_{n+1} = u_n(r)$ geo
- an explicit (general/nth term)
  - $u_n = u_1 + (n-1)d$ arith.
  - $u_n = u_1(r^{n-1})$ geo
- graph (discrete – just dots)





linear

exponential-ish

p. 178 a, c Investigation

a. $2 + 1 + 0.5 + \ldots$

c. $240 - 60 + 15 - 3.75$

i. find r

Series

ii $S_{10} = 3.996$

$S_{15} = 3.9998$

$S_{20} = 3.9999$

Sequence

$u_{10} = .0039$

$u_{15} = 1.22 \times 10^{-4}$

$u_{20} = 3.81 \times 10^{-6}$

converging to 0

smaller + smaller never reach 0

Questions:	Notes:
	IF $\lvert r\rvert < 1$, as $n \to \infty$, $u_n \to 0$ as the term value gets big, the term value approaches 0
	We call a series that "approaches, but never touches" a number a convergent series. The terms will converge to a particular #.
$n \to \infty$	This means $S_n \to \frac{u_1}{1-r}$
	$\lim_{n\to\infty}\left(\frac{u_1(1-r^n)}{1-r}\right) = \frac{u_1}{1-r}$ or $S_\infty = \frac{u_1}{1-r}$
	Sum of 1st n terms of Geo Series
	$r = \frac{1}{2}$ or .5 $\quad \lvert r\rvert < 1$
	$u_1 = 2 \quad S_\infty = \frac{2}{1-\frac{1}{2}} = \frac{2}{\frac{1}{2}} = 4$
	if $\lvert r\rvert > 1$, the series will sum to infinity - not convergent - divergent

Questions:	Notes:
	Ex) The sum of the 1st 3 terms of a geo series is 148, and the sum to infinity is 256.
	Find u_1 and r
$a=b$ $b=c$ then $a=c$	$S_3 = \frac{u_1(1-r^3)}{1-r} = 148$
	System of equations
	$S_\infty = \frac{u_1}{1-r} = 256$
	$\frac{(1-r^3)\,u_1}{1-r} = 256(1-r^3)$
	$256(1-r^3) = 148$
	$1-r^3 = \frac{148}{256}$
	$-r^3 = \frac{148}{256} - 1$
	$\sqrt[3]{r^3} = \left(1 - \frac{148}{256}\right)^{1/3}$
HW LeK p180	$r = \frac{3}{4}$
1, 2ad, 3, 7	Plug in to $S_\infty = \frac{u_1}{1-r}$
	$256 = \frac{u_1}{1-\frac{3}{4}}$
	$\frac{1}{4} \cdot 256 = u_1 \cdot \frac{1}{4}$
	$u_1 = 64$

find Sum of 1st 20 terms of sequence

3rd 10

5th 16

$u_1 = 4$

$d = 3$

$$S_n = \frac{n}{2}(u_1 + (n-1)d)$$

$$S_n = \frac{20}{2}(4 + (19)3)$$

$$= 10(4 + 57)$$

$$= 610$$