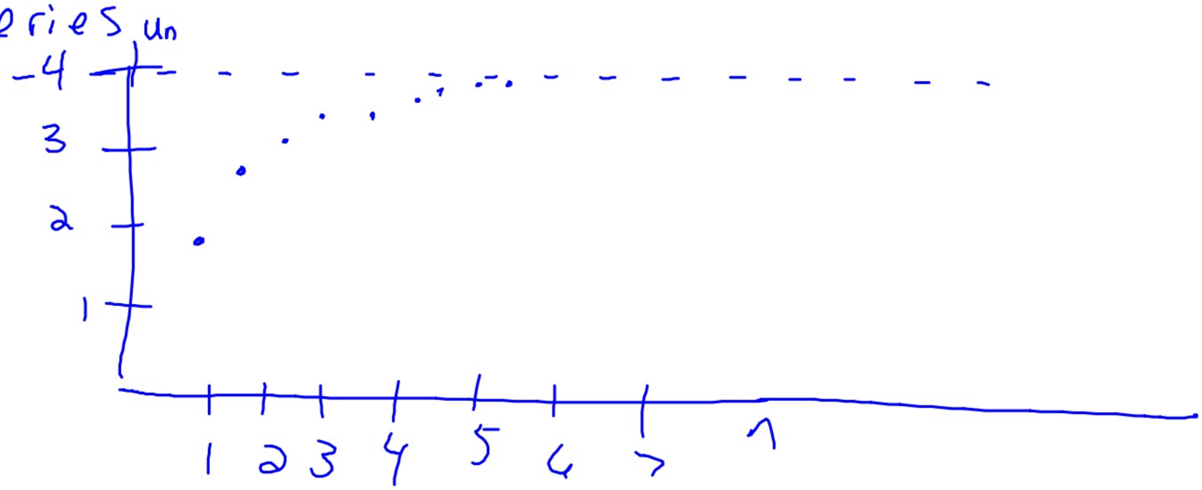
a) $u_1 = 2 \quad r = \frac{1}{2}$

Sequence

getting close to zero - never touching

Series



<u>Convergence</u> - occurs when a series (or sequence) approaches a particular number.

if $|r| < 1$ as $n \to \infty$ (the number of terms gets really big), $u_n \to 0$ (sequence term)

we call a series that "approaches but never touches" a number a <u>convergent series</u>. If $|r| < 1$ and $n \to \infty$, $u_n \to 0$

$$S_n = \frac{u_1(1-\cancel{r^n})}{(1-r)} = \frac{u_1}{1-r}$$

If $|r| > 1$

then $\lim\limits_{n \to \infty} \left(\frac{u_1(1-r^n)}{1-r} \right) = \infty$

we call this <u>divergent</u>

<u>Ex</u> For the series $18 + 6 + 2 + \ldots$

find S_{10}, S_{15}, S_∞

$u_1 = 18$

$r = \frac{1}{3}$

$$S_{10} = \frac{18\left(1 - \left(\frac{1}{3}\right)^{10}\right)}{1 - \frac{1}{3}} = 26.99954275$$

Ex 2) The sum of the 1st 3 terms of a geometric series is 148 and the sum to infinity is 256.

Find u_1 and r

$$S_3 = \frac{u_1(1-r^3)}{1-r} = 148$$

$$S_\infty = \frac{u_1}{1-r} = 256 \rightarrow u_1 = 256(1-r)$$

$|r| < 1$

$$\frac{u_1(1-r^3)}{(1-r^3)} = \frac{148(1-r)}{(1-r^3)}$$

$$u_1 = \frac{148(1-r)}{(1-r^3)}$$

$$\frac{148\cancel{(1-r)}}{(1-r^3)} = 256\cancel{(1-r)}$$

$$\frac{148}{256} = \frac{256}{256}(1-r^3)$$

$$\frac{148}{256} = 1-r^3$$

$$r = \frac{3}{4}$$

p.180

HW 6K

p.180 1, 2ad, 3, 7