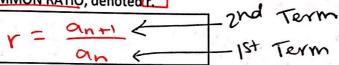
Day 7 - GEOMETRIC SEQUENCES AND SERIES

GEOMETRIC SEQUENCE: A pattern where the RATIO of consecutive terms is always the same (something very similar to this was "Geometric Mean" in Math III).

ou divide the second term by the first, the third term by the second, and so on, what do you get?

is called the COMMON RATIO, denoted r.

In general terms,



Also, generally speaking, a geometric sequence can be written as: {\alpha_1, \alpha_1 \neq \defta_1, \alpha_1 \neq \defta_1 \righta_1 \right

Ex 1: Show that $\{a_n\} = \{2^{-n}\}$ is geometric.

$$r = \frac{2^{-(n+1)}}{2^{-n}} = 2^{-n+1-(-n)} = 2^{-1} = \frac{1}{2}$$
 Since r is a constant, this is Geometric.

Ex 2: Is $\{b_n\} = \left\{-3\left(\frac{1}{4}\right)^n\right\}$ a geometric sequence?

Ex 3: Is $\{a_n\} = \{2n\}$ a geometric sequence?

$$r = \frac{2(n+1)}{2n} = \frac{2n+2}{2n} = \frac{n+1}{n}$$

FINDING A RULE FOR A GEOMETRIC SEQUENCE:

Ex 4: Find the rule for the sequence 2, 6, 18, 54, 162, ...

Ex 5: Find the 17th term of the geometric sequence 2, 2/3, 2/9, 2/27, ...

Ex 6: Given $a_1 = 2$, r = 3, find the 15^{th} term.

$$4a_{15} = \{2(3)^{n-1}\}$$
 $a_{15} = 2(3)^{15-1} = 2(3)^{14} = 9565938$

FINDING A RULE FOR A GEOMETRIC SEQUENCE:

Since r is NOT of constant, this is not Geometric Sequence:

an= 2(113)17-1

7.1

Finite Sequences

Formula:

Ex 7: Find the general sum of $\frac{1}{4} + \frac{2}{4} + \frac{2^2}{4} + \frac{2^3}{4} + \dots + \frac{2^{n-1}}{4}$.

7: Find the general sum of
$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$$

Ex 8: Find the sum of $\frac{1}{4} + \frac{2}{4} + \frac{2^2}{4} + \frac{2^3}{4} + \dots + \frac{2^{14}}{4}$.

8: Find the sum of
$$\frac{1}{4} + \frac{2}{4} + \frac{2^{2}}{4} + \frac{2^{3}}{4} + \dots + \frac{2^{14}}{4}$$
.

 $a_{1} = 1/4$
 $a_{2} = 1/4$
 $a_{3} = 1/4$
 $a_{4} = \frac{1}{4} \cdot (2)^{3/4}$
 $a_{5} = \frac{1}{4} \cdot (1 - 2)^{3/4}$
 $a_{7} = \frac{1}{4} \cdot (2)^{3/4}$
 $a_{7} = \frac{1}{4}$

GEOMETRIC SERIES: A geometric series is the SUM of a geometric sequence that gets infinitely smaller (so 0 < r < 1).

 $\sum_{k=1}^{n-1} a_1 r^{n-1}$

INFINITE

convergent Ex 3 is $[0_n] = \begin{bmatrix} -3 \begin{pmatrix} 1 \\ 2 \end{pmatrix} \end{bmatrix}$ a geometric sequence?

If we use the sum formula listed above, $S_n = a_1 \left(\frac{1-r^n}{1-r} \right)$ and consider that 0 < r < 1 and look at what happens as n INFINITE GEOMETRIC gets closer to infinity, we get that:

Ex 9: Find $1 + \frac{1}{3} + \frac{1}{9} + \dots$ =[3|2 K=1

SERIES 1(1/3) n-1 = 1 = 1 (* NO "n" because

Ex 10: Find 8 + 4 + 2 + ...

Ex 10: Find 8+4+2+...

$$\alpha_1 = 8 \quad = 8 \quad = 10$$
 $Y = \frac{1}{2} \quad X = 1$
 $X = \frac{1}{2} \quad X = 1$

 $\frac{\sum_{k=1}^{\infty} 2 \left(\frac{2}{3}\right)^{k-1}}{\sum_{k=1}^{\infty} 2 \left(\frac{2}{3}\right)^{k-1}} = \frac{2}{1-218} = \frac{2}{113} = \boxed{0}$