PreCalc 11 - Chp 1 Review/Ref Sheet

Note Title 2015-09-24

t_1 - first term value, $t_1 \in \mathbb{R}$
t_n - last or some term value, $t_n \in \mathbb{R}$
n - last or some term number, $n \in \mathbb{N}$,
t_m - some other term value, $t_m \in \mathbb{R}$
m - some other term number, $m \in \mathbb{N}$,
S_n - sum of first n terms.
d - common difference, $d \in \mathbb{R}$
r - common ratio, $r \in \mathbb{R}$

Arithmetic Sequence

$$t_n = t_1 + d(n-1) \qquad t_n = t_m + d(n-m)$$
$$d = t_2 - t_1 \qquad d = t_{n+1} - t_n$$
$$d = \frac{t_n - t_1}{n-1} \qquad d = \frac{t_n - t_m}{n-m}$$

Arithmetic Series

$$S_n = t_1 + t_2 + t_3 + \ldots + t_n$$
$$S_n = \frac{n(t_1 + t_n)}{2}$$
$$S_n = \frac{n(2t_1 + d(n-1))}{2}$$
$$S_{n+1} = S_n + t_{n+1}$$

Choose a formula based on what you have or need. Substitute known values. If there are 2 variables, then you chose the wrong formula.

Geometric Sequence:

$$t_n = t_1 r^{n-1} \qquad t_n = t_m r^{n-m}$$
$$r = \frac{t_2}{t_1} \qquad r = \frac{t_{n+1}}{t_n}$$

If $r<0$ and n is odd, the answer has +/-. If n is even, then the answer is only positive or negative based on t_1.

for $x = r^n$, we can find $n = \frac{\log x}{\log r}$ $\quad x, r > 0$

Geometric Series

$$S_n = t_1 + t_2 + t_3 + \dots t_n$$

$$S_n = \frac{t_1(1-r^n)}{1-r}, \quad r \neq 1$$

$$S_n = \frac{t_1(r^n-1)}{r-1}, \quad r \neq 1$$

$$S_n = \frac{t_m(r^{n-m+1}-1)}{r-1}, \quad r \neq 1$$

$$S_{n+1} = S_n + t_{n+1}$$

$r > 1$, the sequence is increasing.
$0 < r < 1$, the sequence is decreasing.
$-1 < r < 0$, the sequence is oscillating towards 0
$r < -1$, the sequence is oscillating away from 0.

$|r| > 1$, the series is increasing faster
$|r| < 1$, the series is decreasing slower towards a horizontal asymptote

$$S_\infty = \frac{t_1}{1-r}, \quad |r| < 1$$