

1.4 Geometric Series

Similar to an arithmetic series, a geometric series is the sum of the terms of a geometric sequence.

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2, 5, 8... is an arithmetic sequence

2 + 5 + 8 + ... is an arithmetic series

2, 6, 18... is a geometric sequence

2 + 6 + 18 + ... is a geometric series

The sum of the first n terms of a geometric series is given by :

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

Where t_1 is the first term of the series

n is the number of terms

r is the common ratio

S_n is the sum of the first n terms

Example 1:

Determine the sum of the first 10 terms of each geometric series:

a.) $3 + (-12) + 48 + \dots$

b.) $t_1 = 3, r = \frac{1}{4}$

Example 2:

Determine the sum of each geometric series: (you may need to find n first)

a.) $2 + 4 + 8 + \dots + 8192$

b.) $\frac{1}{64} - \frac{1}{16} + \frac{1}{4} + \dots + 16384$

There is a variation of the formula that involves knowing the last term in a geometric series:

$$S_n = \frac{rt_n - t_1}{r - 1}, r \neq 1$$

Example 3:

Confirm the sum of series from Example 2:

a.) $2 + 4 + 8 + \dots + 8192$

b.) $\frac{1}{64} - \frac{1}{16} + \frac{1}{4} + \dots + 16384$