

Section 9.5 Geometric Series

geometric series: the sum of the terms of a geometric sequence

$$a_1 + a_1r + a_1r^2 + a_1r^3 + \dots + a_1r^{n-1}$$

Finite $S_n = \frac{a_1(1-r^n)}{1-r}$

Infinite $|r| < 1$

Converges

$$S_n = \frac{a_1}{1-r}$$

Infinite $|r| > 1$

Diverges

does not have a finite sum

Problem 1:

What is the sum of the geometric series?

a. $4 + 12 + 36 + 108 + 324 + 972 + 2916$

b. $\sum_{n=0}^{11} 3(-1.5)^n$

Problem 2:

A game show is offering a prize of 1 cent on the first day, 3 cents on the second day, 9 cents on the third day, etc. What is the total amount of money earned from this prize in two weeks?

Problem 3: Does the infinite series converge or diverge? If it converges, what is the sum?

a. $-5 - \frac{5}{2} - \frac{5}{4} - \frac{5}{8} - \frac{5}{16} - \dots$

b. $\frac{1}{4} - \frac{3}{8} + \frac{9}{16} - \frac{27}{32} + \dots$

c. $\sum_{n=0}^{\infty} (0.8)^n$