Algebra II

11-6

Infinite Geometric Series

Sum of an infinite geometric series:

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

IMPORTANT: $|r| < 1$, otherwise there is no sum.

For each geometric series, find the sum. If the series has no sum, say so.

1) $24 + 12 + 6 + 3 + \ldots$

$r = \frac{1}{2}$ Is $|r| < 1$? Yes!

$$S_\infty = \frac{a_1}{1-r} = \frac{24}{1-\frac{1}{2}} = \frac{24}{\frac{1}{2}} = 24 \cdot \frac{2}{1} = \boxed{48}$$

For each geometric series, find the sum. If the series has no sum, say so.

11) $\sum_{n=0}^{\infty} 3\left(\frac{1}{4}\right)^n = \underset{a_0}{3(\frac{1}{4})^0} + \left[\underset{a_1}{3(\frac{1}{4})^1} + \underset{a_2}{3(\frac{1}{4})^2} + \cdots\right]$

S_∞

Is $|r| < 1$? $r = \frac{1}{4}$ Yes!

$$S_\infty = \frac{a_1}{1-r} = 3 + \frac{\frac{3}{4}}{1-(\frac{1}{4})} = 3 + \frac{\frac{3}{4}}{\frac{3}{4}} = 3 + 1 = \boxed{4}$$

Write the first three terms of the infinite geometric series satisfying the given condition.

23) $t_1 = 8, S_\infty = 12$

$S_\infty = \frac{a_1}{1-r}$

$\frac{12}{1} = \frac{8}{1-r}$

Means + Extremes Thm

$1-r = \frac{8}{12}$

$1-1-r = \frac{2}{3}-1$

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

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

$a_1 = 8$

$a_2 = 8\left(\frac{1}{3}\right) = \frac{8}{3}$

$a_3 = \frac{8}{3}\left(\frac{1}{3}\right) = \frac{8}{9}$

Assignment:

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1-12 all,
24-26 all