Advanced Math

9a-3

Geometric Sequences

Geometric Sequence - each term shares a common ratio

multiplier

Determine whether or not the sequence is geometric. (pg 735)

1) 5, 15, 45, 135, . . . (·3 ·3 ·3)

Yes

$r = 3$

3) 3, 12, 21, 30, . . . (·4 ·$\frac{7}{4}$)

No

*n*th term of a Geometric Sequence:

$a_n = a_1 r^{n-1}$

Write the first five terms of the geometric sequence.

11) $a_1 = 2, r = 3$

$a_2 = 6$

$a_3 = 18$

$a_4 = 54$

$a_5 = 162$

Sum of a geometric sequence:

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

Evaluate.

59) $\sum_{n=0}^{20} 3\left(\frac{3}{2}\right)^n$

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

$a_1 = 3\left(\frac{3}{2}\right)^1 = \frac{9}{2}$

$a_0 \rightarrow a_0 = 3\left(\frac{3}{2}\right)^0 = 3(1) = 3$

$S_{20} = \frac{\frac{9}{2}\left[1-\left(\frac{3}{2}\right)^{20}\right]}{1-\frac{3}{2}} + 3 = 29{,}921.311$

$a_0 = 3\left(\frac{3}{2}\right)^0 = 3$

$a_1 = 3\left(\frac{3}{2}\right)^1 = \frac{9}{2}$

This problem is sneaky because the formula specifically calls for a_1 and the sigma starts at $n = 0$. Therefore, a_0 needs to be added to the sum at the end.

Sum of an infinite geometric series:

$S_\infty = \frac{a_1}{1-r}$, only if $r < 1$

Evaluate.

81) $\sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^n$ $r = \frac{1}{2}$

$a_0 = \left(\frac{1}{2}\right)^0 = 1$

$a_1 = \left(\frac{1}{2}\right)^1 = \frac{1}{2}$

$S_\infty = \frac{\frac{1}{2}}{1-\frac{1}{2}} + 1$ (a_0)

$= 1 + 1$

$S_\infty = 2$

$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \cdots$

Assignment:

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2-26 every 4th,

28-38 even,

56-66 even,

82-92 even.