Unit 4 "Bare Necessities" - Sequences and Series

Classifying Sequences

arithmetic → has common difference (term − previous term)

geometric → has common ratio (term ÷ previous term)

neither → no common difference and no common ratio

1) 7, 10, 13, ...

arithmetic

$d = 3$

2) 1, −2, 4, ...

geometric

$r = -2$

3) 1, 4, 9, ...

neither

4) $\frac{10}{3}, \frac{7}{3}, \frac{4}{3}, \ldots$

arithmetic

$d = -1$

5) 2, −6, −18, ...

neither

6) 25, 5, 1, ...

geometric

$r = \frac{1}{5}$

Explicit and Recursive Formulas

explicit:

arithmetic: $a_n = a_1 + (n-1) \cdot d$

geometric: $a_n = a_1 \cdot (r)^{n-1}$

recursive:

arithmetic: $a_n = a_{n-1} + d$

geometric: $a_1 =$, $a_n = a_{n-1} \cdot r$

Write the explicit and recursive formulas for each sequence.

7) −22, −18, −14, ...

$a_n = 4n - 26$

$a_1 = -22;\ a_n = a_{n-1} + 4$

8) −3, $-\frac{3}{2}$, $-\frac{3}{4}$, ...

$a_n = -3\left(\frac{1}{2}\right)^{n-1}$

$a_1 = -3;\ a_n = \frac{1}{2} \cdot a_{n-1}$

9) 1, 4, 16, ...

$a_n = 1(4)^{n-1}$

$a_1 = 1;\ a_n = 4 \cdot a_{n-1}$

10) 9, 3, −3, ...

$a_n = -6n + 15$

$a_1 = 9;\ a_n = a_{n-1} - 6$

Find the specified term of each sequence.

11) Find a_7 of the sequence 2, −3, 4.5, ...

22.781

12) Find a_{19} of the sequence −1, 3, 7, ...

71

13) Find a_8 of the sequence 168, 84, 42, ...

1.313

14) Find a_{12} of the sequence −3, −5, −7, ...

−25

Sums of Series

finite arithmetic: $S_n = \frac{n}{2}(a_1 + a_n)$

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

infinite geometric: $S = \frac{a_1}{1-(r)}$ where $|r| < 1$

15) Find the sum of the first eighteen terms of the series $8 + 11 + 14 + \ldots$

603

16) Find the sum of the series $-6 - 3 - 1.5 - \ldots$

-12

17) Find the sum of the first twelve terms of the series $1 + 3 + 9 + \ldots$

265720

18) Find the sum of the first ten terms of the series $\frac{1}{3} + \frac{4}{3} + \frac{16}{3} + \ldots$

116508.333

19) Find the sum of the series $5 + 6 + \frac{36}{5} + \ldots$

DNE

20) Find the sum of the first sixteen terms of the series $4 + 1 - 2 - \ldots$

-296

21) Find the sum of the series $18 + 12 + 8 + \ldots$

54

Applications of Sequences and Series

22) The distance, in feet, that a free-falling body falls in each second, starting with the first second, is given by the sequence 16, 48, 80, ... Find the distance that the body falls in the ninth second.

272 feet

23) In a financial deal, you are given $700 the first day and each day after that you will receive 65% of the previous day's amount. How much money will you have earned after twelve days?

$1988.62

24) A forty row theater has ten seats in the front row. The second row has twelve seats. If each row has two more than the row in front of it, how many seats are there in the theater?

1960 seats

25) A man swims 1.5 mi on Monday, 1.65 mi on Tuesday ,and 1.815 mi on Wednesday. If the pattern continues, how many miles will he swim on Saturday?

2.416 miles

26) An embroidery pattern calls for five stitches in the first row and for three more stitches in each successive row. The 25th row, which is the last row, has 77 stitches. Find the total number of stitches in the pattern

1025 stitches