Sequences and Series

SEQUENCES AND SERIES

45. State whether each sequence is arithmetic, geometric or neither and find a formula for a_n.

   a. 17, 12, 7, 2, ... b. 3, 8, 15, 24, 35,... c. -81, 27, -9, 3,...

46 a. Find the 17th term of 3, 6, 9, ...

   b. Find the sum of the first 17 terms of 3, 6, 9, ...

47. In a geometric sequence, $a_3 = 4$ and $a_6 = \dfrac{4}{27}$. Find a_{10}.

48. In an arithmetic sequence, $a_3 = 23$ and $a_6 = 50$. Find a_{24}.

49. An auditorium has 30 rows of seats. There are 20 seats in the first row, 24 seats in the second row, 28 seats in the third row, and so on. Determine the seating capacity in the auditorium.

50. Given the series $1 - \dfrac{1}{3} + \dfrac{1}{9} - \dfrac{1}{27} + \cdots$

   a) Does it converge or diverge?

   b) Find the sum, if possible.

51. Find the sum of the first 8 terms of $1, -\dfrac{1}{3}, \dfrac{1}{9}, -\dfrac{1}{27}, \cdots$

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Answers

45a. arith $a_n = -5n + 22$ **45b.** neither; $a_n = n^2 + 2n$ **45c.** geometric; $a_n = -81\left(-\dfrac{1}{3}\right)^{n-1}$

46a. 51

46b. 459   **47.** $\dfrac{4}{2187}$ **48.** 212   **49.** 2340

50a. converge   **50b.** $\dfrac{3}{4}$ **51.** $\dfrac{1640}{2187}$

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52. Find the interval of convergence and the sum in terms of x of:

$$1+\frac{2x}{3}+\frac{4x^2}{9}+...$$

53. Express the following series in sigma notation:
8 + 5 + 2 − 1 − 4 − 7 − 10 − 13

54. $t_1 = 1$
$t_{k+1} = t_k + 2k + 1$

a) Write the first 6 terms

b) Write an explicit formula

55. Evaluate the following:

a. $\sum_{n=3}^{7}(4n-7)$

b. $\sum_{k=1}^{20}2k(k-1)$

56. Express in sigma notation: 5 + 9 + 13 + ...+ 101

57. For what values of x do the following converge?

a) 1 + (x-3) + (x-3)^2 + ...

b) 1 + 3x + 9x^2 + ...

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52. $-\dfrac{3}{2} < x < \dfrac{3}{2}; \dfrac{3}{3-2x}$ **53.** $\displaystyle\sum_{i=1}^{8}(-3n+11)$ **54a.** 1, 4, 9, 16, 25, 36   **54b.** $a_n = n^2$

55a. 65   **55b.** 5320   **56.** $\displaystyle\sum_{i=1}^{25}(4n+1)$

57a. $2 < x < 4$ **57b.** $-\dfrac{1}{3} < x < \dfrac{1}{3}$

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58. Given the series $1 + \dfrac{1}{3} + \dfrac{1}{9} + \dfrac{1}{27} + \cdots$

   a) Express the series in sigma notation.

   b) Find the sum.

59. Write a recursive definition for the following sequence:

   6, 10, 14, 18, 22, …
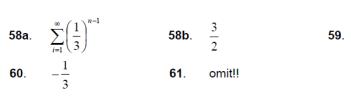
60. For what value of x does the following sequence converge

   to $\dfrac{3}{5}$? $1 + 2x + 4x^2 + \ldots$

61. Prove by Mathematical Induction.

   $$\sum_{i=1}^{n}(4i-1) = n(2n+1)$$

   a. $\displaystyle\sum_{n=3}^{7}(4n-7)$

   b. $\displaystyle\sum_{k=1}^{20} 2k(k-1)$

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58a. $\displaystyle\sum_{i=1}^{\infty}\left(\frac{1}{3}\right)^{n-1}$

58b. $\dfrac{3}{2}$

59. $a_1 = 6$
$a_n = a_{n-1} + 4$

60. $-\dfrac{1}{3}$

61. omit!!