Sequences and Series – Problems

1. For each of the sequences determine if it's arithmetic, geometric, recursive, or none of these.

(a) $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \dots$

(b) $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \dots$

(c) $-1, 3, 7, 11, 15, 19, \dots$

(d) $1, 2, 2, 4, 16, 256, \dots$

2. For each sequence find a formula for a_n. (A recursive formula is ok.)

(a) $\frac{2}{3}, \frac{5}{9}, \frac{8}{27}, \frac{11}{81}, \dots$

(b) $\frac{-1}{2}, \frac{1}{4}, \frac{-1}{8}, \frac{1}{16}, \frac{-1}{32}, \dots$

(c) $\frac{2}{3}, \frac{4}{5}, \frac{6}{7}, \frac{8}{9}, \dots$

(d) $1, 1, 1, 3, 5, 9, 17, 31, \dots$

(e) $9, 3, -3, -9, -15, -21, \dots$

3. For each sequence find a_{10}.

(a) $a_n = \dfrac{1}{n^2 + n + 1}$

(b) $a_1 = 1, a_2 = 2$, $a_n = a_{n-1} + 2a_{n-2}$ for $n \geq 3$.

(c) $a_n = 325 - 14n$

(d) $a_n = \dfrac{2^{n-1}}{3^n}$

4. For each sequence, find the first seven terms.

(a) $a_1 = 2, a_2 = 5$, $a_n = 2a_{n-1} - 3a_{n-2}$ for $n \geq 3$.

(b) $a_n = \dfrac{(-1)^{n+1}n + 3}{2^n}$

(c) $a_n = \dfrac{(-1)^n}{3^{n-2}}$

(d) $a_n = 36 + 12n$

5. For each series, find S_5.

(a) $\displaystyle\sum_{i=1}^{\infty} \frac{1}{i}$

(b) $\displaystyle\sum_{i=1}^{\infty} \frac{2}{5^{i+3}}$

(c) $\displaystyle\sum_{i=1}^{\infty} 2i+3$

(d) $\displaystyle\sum_{i=1}^{\infty} i^2$

6. Determine if the given series is geometric. If it is, find r. If $|r|<1$, find the value of the series.

(a) $\displaystyle\sum_{i=1}^{\infty} \frac{2^{i-1}}{5^{i+3}}$

(b) $\displaystyle\sum_{i=1}^{\infty} \frac{1}{i}$

(c) $\displaystyle\sum_{i=1}^{\infty} \frac{(-1)^{i+1}}{3^i}$.

(d) $1+4+16+64+\cdots$

7. Express each series in sigma notation.

(a) $1+\frac{1}{3}+\frac{1}{5}+\frac{1}{7}+\cdots$

(b) $\frac{1}{2}-\frac{3}{4}+\frac{5}{8}-\frac{7}{16}+\frac{9}{32}-\cdots$

(c) $-5-1+3+7+11+\cdots$

(d) $\frac{3}{4}+\frac{6}{8}+\frac{9}{12}+\frac{12}{16}+\frac{15}{20}+\frac{18}{24}+\cdots$