SERIES I

1. Define a sequence $\{s_n\}_{n=1}^{\infty}$ as follows:

$$s_1 = \frac{1}{2} \text{ and } s_{n+1} = s_n + \frac{1}{2^{n+1}}$$

a) Calculate s_2, s_3, s_4, and s_5.

b) Find a (non-recursive) formula for s_n.

c) Calculate $\lim_{n\to\infty} s_n$.

2. Define a sequence $\{s_k\}_{k=1}^{\infty}$ as follows:

$$s_k = \sum_{n=1}^{k} \frac{2}{n(n+2)}$$

a) Calculate s_1, s_2, and s_3. (This will be less helpful than it was in the last problem).

b) Find a partial fraction decomposition for $\dfrac{2}{n(n+2)}$.

c) Use your partial fraction decomposition to find a formula for s_k.

d) Calculate the limit $\lim_{k\to\infty} s_k$.

3. Decide if each of the following sequences converges or diverges. It's okay to guess, by try to explain what you're thinking.

a) $s_1 = \dfrac{1}{3}$ and $s_{n+1} = s_n + \dfrac{1}{3^{n+1}}$

b) $s_1 = 1$ and $s_{n+1} = s_n + (-1)^{n+1}$

c) $s_1 = 1$ and $s_{n+1} = s_n + \dfrac{n+1}{n}$

d) $s_1 = 1$ and $s_{n+1} = s_n + \dfrac{1}{n+1}$

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