1. Suppose that the first term of a certain sequence is $a_1 = 9$ and that the remainder of the terms of the sequence are defined recursively by the formula $a_{k+1} = 27 - \frac{a_k}{3}$. Find, by hand, the first four terms of this sequence. After you have done that, find the first four terms in the sequence of partial sums of the series $\sum_{k=1}^{\infty} a_k$. 
2. Prove that \( \sum_{k=1}^{\infty} \frac{4 \cdot 2^{1-2k}}{3^{-k}} \) is a convergent geometric series and find the value to which the series sums. Show work consistent with that done in the example on page 11 of the week 2 lecture notes. *Do not modify the given term formula in any way.*
3. Rigorously establish a formula for the sequence of partial sums for the series \( \sum_{k=1}^{\infty} a_k \) where
\[
a_k = \frac{15}{2k + 4} - \frac{11}{2k + 6} - \frac{4}{2k + 8}.
\]
Make sure that you clearly establish that each partial sum in your work fits the formula. Then use your formula to establish the sum of the series. Show work consistent with that done in the example on page 7 of the week 2 lecture notes. Please note that \( a_k \) has already been defined in this problem.