1. What is wrong with the following reasoning?

$$\sum_{k=1}^{\infty} \frac{1}{k+1}$$ diverges because it is the harmonic series with the first term deleted.

$$\sum_{k=1}^{\infty} \frac{1}{k+2}$$ diverges because it is the harmonic series with the first 2 terms deleted.

$$\sum_{k=1}^{\infty} \left(\frac{1}{k+1} - \frac{1}{k+2} \right)$$ diverges because it is the difference of divergent series.

2. $\{(n-1)(n-2)(n-3)(n-4)(n-5)(n-6)\}_{n=1}^{+\infty}$

a) Write the first 8 terms of the sequence.

b) Determine whether the sequence converges or diverges.

3. Find $\lim\limits_{n \to \infty} \left(1 + \dfrac{1}{3^2} + \dfrac{1}{3^4} + \dfrac{1}{3^6} + ... + \dfrac{1}{3^{2n}} \right)$

4. A series has $s_8 = 20$ and $s_9 = 25$. Find the a_9, the 9th term of the series.

5. A series has $s_n = \dfrac{3n}{2n+1}$.

a) Find a_n

b) Determine if the series converges or diverges.