(1) Find the limit of the following sequences, if it exists or show that it does not converge.

(i) $a_n = 3 + (0.1)^n$

(ii) $a_n = \frac{n+(-1)^n}{n}$

(iii) $a_n = \frac{n+2}{n^2+5n+6}$

(iv) $a_n = \sin(\frac{\pi}{2} + \frac{1}{n})$

(v) $a_n = \frac{2^n}{n^3}$

(vi) $a_n = \frac{n!}{n^n}$

(vii) $a_n = (\frac{n}{n+1})^n$

(viii) $a_n = \frac{n^2}{2n-1} \sin \frac{1}{n}$

(ix) $a_n = (2^n + 3^n)^{1/n}$

(x) $a_n = \sqrt[n]{n^2 + n}$

(2) If a_n is a sequence of real numbers and if the subsequences a_{2n} and a_{2n-1} both converge to the same limit, then show that a_n also converges to the same limit.

(3) If $a_1 = 2$ and $a_{n+1} = \frac{72}{1+a_n}$ for $n \geq 1$, then show that the sequence is convergent and find its limit.

(4) If $a_1 > 0$ and for $n \geq 1$, $a_{n+1} = \frac{1}{2}(a_n + \frac{2}{a_n})$, then show that the sequence $\{a_n\}_{n=2}^{\infty}$ is non-increasing and bounded. Also, find the limit of the sequence $\{a_n\}$.