Calculus 1 - Homework 2

1. (3 points) Calculate the limit of the sequence $a_n = \sqrt[n]{\dfrac{n^2+3n}{4n^3-n+1}}$

2. (6 points) Calculate the limit of the following sequences:

a) $a_n = \left(\dfrac{3n-1}{3n+5}\right)^{2n+7}$ **b)** $a_n = \left(\dfrac{3n-1}{3n+5}\right)^{n^2}$

3. (5 points) Let $a_1 = 3$ and $a_{n+1} = \sqrt[3]{5a_n^2 - 4a_n}$ for all $n \in \mathbb{N}$. Investigate the convergence of (a_n).

7. (10 points) Decide whether the following series are absolutely convergent, conditionally convergent or divergent:

a) $\sum_{n=1}^{\infty} (-1)^n \cdot \dfrac{1}{\sqrt[n]{n^{10}+2n+1}}$ **b)** $\sum_{n=1}^{\infty} (-1)^n \cdot \dfrac{n+2}{n^2}$ **c)** $\sum_{n=1}^{\infty} (-1)^n \cdot \dfrac{n^2+3n-5}{2n^5-n^3+6}$

8. (6 points) Decide whether the following series are convergent or divergent:

a) $\sum_{n=1}^{\infty} \left(\dfrac{n^2+6}{n^2+4}\right)^{n^3} \cdot \dfrac{n^2}{3^{2n-1}}$ **b)** $\sum_{n=1}^{\infty} \dfrac{(2n)!}{3^n \cdot (n!)^2}$

Deadline: October 24th