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## Calculus 1 - Homework 2.

1. (3+3 points) Calculate the limit of the following sequences:

a)  $a_n = \left(\frac{3n+4}{3n+7}\right)^{2n}$       b)  $a_n = \left(\frac{n^2+2n}{n^2+2}\right)^{n^2}$

2. (3+3 points) Calculate the limit of the following sequences if it exists:

a)  $a_n = \sqrt[n]{\frac{n^3 - 4n^2 + 8}{n^4 + 3n^3 - 7n}}$       b)  $a_n = \sqrt[n]{3^n + 5^{(-1)^n \cdot n}}$

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  $(a_n)$ .

4. (3 points) Evaluate the sum of the following series:  $\sum_{n=1}^{\infty} \frac{2^{3n+1} + (-5)^{n-1}}{3^{2n+1}}$

5. (3+3 points) Decide whether the following series are convergent or divergent:

a)  $\sum_{n=1}^{\infty} \frac{3n^2 + \sqrt{n} + 2}{2n^6 - n^4 + 3n}$       b)  $\sum_{n=1}^{\infty} \frac{1}{\sqrt[n]{n^{10} + 6n + 1}}$

6.\* (4 points) Calculate the limit of the following sequence if it exists:

$$x_n = \sqrt[n^2]{(2n+1)! - (2n)!}$$

Deadline: October 18th