MATHEMATICS

Monday October 26 2015

Fifth Exercise Class

1) Evaluate the following limits

$$\lim_{n \to +\infty} \frac{n^4 + 5}{n^5 + 7n - 1}$$

$$\lim_{n \to +\infty} \frac{1 - n^2}{(3n + 2)^2}$$

$$\lim_{n \to +\infty} \frac{n + (-1)^n}{n - (-1)^n}$$

$$\lim_{n \to +\infty} (\sqrt{n + 2} - \sqrt{n - 1})$$

$$\lim_{n \to +\infty} \sqrt{n + 1} - n$$

$$\lim_{n \to +\infty} n\sqrt{\frac{1}{n + 1}}$$

$$\lim_{n \to +\infty} (e^n - 2^n)$$

$$\lim_{n \to +\infty} \frac{2^{n+1} - 4^{n-1}}{3^n}$$

$$\lim_{n \to +\infty} \sqrt[n]{2n}$$

$$\lim_{n \to +\infty} (2^n - n^2)$$

$$\lim_{n \to +\infty} \frac{2^n - 4^n}{3^n - n!}$$

$$\lim_{n \to +\infty} \frac{\sqrt{n}}{\log n}$$

$$\lim_{n \to +\infty} \sqrt[n]{3^n + 4^n}$$

$$\lim_{n \to +\infty} (\log(2n - 5) - \log(n^2 + 6))$$

$$\lim_{n \to +\infty} (3^{n+1} - 3^{\sqrt{n^2 - 1}})$$

$$\lim_{n \to +\infty} \left(\frac{n + 1}{n}\right)^{2n}$$

$$\lim_{n\to+\infty} \left(\frac{n^2+n}{n^2-n+2}\right)^n$$

$$\lim_{n\to+\infty} n\sin\left(\frac{3}{n}\right)$$

$$\lim_{n\to+\infty} n\tan\left(\frac{1}{n}\right)$$

$$\lim_{n\to+\infty} \frac{\sin(1/n)}{\sin(3/n)}$$

$$\lim_{n\to+\infty} \frac{\tan^2(1/n)}{1-\cos(1/n)}$$

$$\lim_{n\to+\infty} \frac{1-\cos(3/n)}{\sin(3/n^2)}$$

$$\lim_{n\to+\infty} (n-\sin(n))$$

$$\lim_{n\to+\infty} \frac{3+\sin(n)}{n}$$

2) Prove that the following sequences do not admit limit

$$a_n = n\sin\left(\frac{\pi}{2}+n\pi\right)$$

$$a_n = \log n \cdot \cos(\pi n)$$

$$a_n = (-1)^n(n-n^2)$$

3) For each of the following series determine if it converges or diverges. In case of convergent series, calculate the sum.

$$\sum_{n=0}^{\infty} \left(\frac{3}{4}\right)^n$$

$$\sum_{n=1}^{\infty} (-1)^n e^{-n+1}$$

$$\sum_{n=0}^{\infty} \frac{(-1)^n + 3^n}{5^n}$$

$$\sum_{n=0}^{\infty} \frac{2^{4n}}{3^{2n}}$$

$$\sum_{n=0}^{\infty} \frac{(-1)^n 3^{n+2}}{5^n}$$

$$\sum_{n=1}^{\infty} \frac{2^{2n+1}}{3^{2n}}$$