Esercitazione di Analisi Matematica I

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1. Studiare la convergenza delle seguenti serie numeriche:

$$\sum_{n=1}^{\infty} \frac{2n+3}{n3^n}, \qquad \sum_{n=1}^{\infty} \frac{(3n+1)^3}{(n^3+2)^2} \cos(6n^2-1)\ , \qquad \sum_{n=0}^{\infty} \left(\sqrt{n^2+1}-n\right)^2$$

$$\sum_{n=0}^{\infty} \frac{\sin n}{\sqrt{n^3+7}}, \qquad \sum_{n=1}^{\infty} \frac{n \log n}{(n^2+1)^2)}, \qquad \sum_{n=2}^{\infty} \frac{1}{(\log n)^{\log n}}$$

$$\sum_{n=0}^{\infty} (-1)^{n+1} \frac{\sqrt{n}}{n+3}, \qquad \sum_{n=1}^{\infty} \frac{1}{n} - \log \frac{n+1}{n}, \qquad \sum_{n=1}^{\infty} \frac{\log n}{n^3}$$

$$\sum_{n=1}^{\infty} \log \sqrt[n]{n}, \qquad \sum_{n=1}^{\infty} n e^{-\sqrt{n}}, \qquad \sum_{n=2}^{\infty} \frac{1}{(\log n)^{\log(\log n)}}$$

2. Studiare la convergenza delle seguenti serie al variare del parametro $x \in \mathbb{R}$:

$$\sum_{n=0}^{\infty} \frac{x^n+3^n}{4^n+5^n}, \qquad \sum_{n=0}^{\infty} n^x e^{\sqrt{n}}, \qquad \sum_{n=0}^{\infty} n! x^n$$

$$\sum_{n=2}^{\infty} \frac{1}{n(\log n)^x}, \qquad \sum_{n=1}^{\infty} \left(1-\frac{x}{n}\right)^{n^2}, \qquad \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{2^{2n}(n!)^2}$$

$$\sum_{n=0}^{\infty} (-1)^n \frac{n}{n^2+1} x^n, \qquad \sum_{n=1}^{\infty} x^{\log n}, \qquad \sum_{n=1}^{\infty} x^{\sqrt{n}}$$

$$\sum_{n=1}^{\infty} \frac{n^x}{x^n}, \qquad \sum_{n=1}^{\infty} \left(\sin\frac{1}{n}\right) x^n, \qquad \sum_{n=1}^{\infty} (-1)^n \log\left(1+\frac{1}{n}\right) x^n$$

$$\sum_{n=2}^{\infty} \left(\frac{\pi}{2} - \arctan n^x\right), \qquad \sum_{n=2}^{\infty} \frac{\sqrt{n+1}-\sqrt{n}}{n^x}, \qquad \sum_{n=2}^{\infty} \frac{n(3x-4)^n}{\sqrt[3]{n^4}(2x)^{n-1}}$$

$$\sum_{n=1}^{\infty} \frac{x^n \log n}{2+\sin n}, \qquad \sum_{n=1}^{\infty} \frac{\log n}{n} (\cos x)^n, \qquad \sum_{n=2}^{\infty} \frac{\log\left(\cos\sqrt{n^{-1/5}+n^{-1/7}}\right)}{n^x \log n}$$