Problem 1

The sequence $\left\{\dfrac{\tan n}{n}\right\}_{n\geq 1}$ is not bounded.

Problem 2

Prove or disprove: $\displaystyle\sum_{n=1}^{\infty}\frac{\sin(n\sqrt{n})}{\sqrt{n}}$ is convergent.

Problem 3

Prove or disprove: $\displaystyle\sum_{n=1}^{\infty}\frac{1}{n^3\sin^2 n}$ is convergent.

Problem 4

Evaluate: $\lim\limits_{n\to\infty}\sin n!$.

Problem 4

If $\lim\limits_{n\to\infty}\dfrac{\tan n}{n^a}=0$, find the minimum value $a\in\mathbb{R}_+$ can take.