

PROBLEM SET 15: ABSOLUTE CONVERGENCE; RATIO AND ROOT TESTS

Note: Most of the problems were taken from the textbook [1].

Problem 1. *Use the Ratio Test to determine whether the series is convergent or divergent.*

a) $\sum_{n=1}^{\infty} \frac{1}{n!};$

b) $\sum_{n=1}^{\infty} \frac{n!}{100^n};$

c) $\sum_{n=1}^{\infty} \frac{\cos(n\pi/3)}{n!};$

d) $\sum_{n=1}^{\infty} \frac{n!}{n^n};$

e) $\sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2};$

f) $\sum_{n=1}^{\infty} \frac{2 \cdot 4 \cdot 6 \cdots (2n)}{n!};$

Problem 2. *Use the Root Test to determine whether the series is convergent or divergent.*

a) $\sum_{n=1}^{\infty} \left(\frac{n^2+1}{2n^2+1} \right)^n;$

b) $\sum_{n=2}^{\infty} \frac{(-1)^{n+1}}{(\ln n)^n};$

c) $\sum_{n=1}^{\infty} \left(\frac{-2n}{n+1} \right)^{5n};$

d) $\sum_{n=1}^{\infty} \left(1 + \frac{1}{n} \right)^{n^2};$

e) $\sum_{n=0}^{\infty} (\tan^{-1}(n))^n.$

REFERENCES

- [1] J. Stewart: *Single Variable Calculus* 8th Edition, Cengage Learning, Boston 2015.