

PROBLEM SET 13: THE COMPARISON TESTS

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

Problem 1. *Decide whether each series is convergent or divergent.*

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

b) $\sum_{n=1}^{\infty} \frac{1+\cos n}{e^n}$;

c) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+1}}$;

d) $\sum_{n=1}^{\infty} \frac{e^n+1}{ne^n+1}$;

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

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

g) $\sum_{n=1}^{\infty} \frac{e^{1/n}}{n}$;

h) $\sum_{n=1}^{\infty} \sin(1/n)$.

Problem 2. *Show that if $a_n > 0$ and $\lim_{n \rightarrow \infty} na_n \neq 0$, then $\sum a_n$ is divergent.*

Problem 3. *Show that if $a_n > 0$ and $\sum a_n$ is convergent, then $\sum \ln(1 + a_n)$ is convergent.*

REFERENCES

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