

PROBLEM SET 11: SERIES

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

Problem 1. *Decide whether each series is convergent or divergent. If it is convergent, compute its value.*

a) $\sum_{n=1}^{\infty} \frac{5}{\pi^n};$

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

c) $\sum_{n=1}^{\infty} (\sin 100)^n;$

d) $\sum_{n=1}^{\infty} \frac{3}{n(n+3)}$

e) $\sum_{n=0}^{\infty} (\sqrt{3})^{-n};$

f) $\sum_{n=1}^{\infty} \tan^{-1}(n);$

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

h) $\sum_{n=1}^{\infty} \left(\frac{1}{e^n} + \frac{1}{n(n+1)} \right).$

Problem 2. *Determine the values of x for which the following series converges.*

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

b) $\sum_{n=0}^{\infty} \frac{\sin^n x}{3^n};$

c) $\sum_{n=0}^{\infty} e^{nx};$

Problem 3. *Show that the following series is divergent and also show that its sequence of terms converges to zero:*

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

REFERENCES

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