

## PROBLEM SET 18: REPRESENTATIONS OF FUNCTIONS AS POWER SERIES

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

**Problem 1.** Find the power series representation for each of the functions below and determine the interval of convergence.

a)  $\frac{5}{1-4x^2}$ ;

b)  $\ln(5-x)$ ;

c)  $\frac{x^2}{x^4+16}$ ;

d)  $\tan^{-1}(2x)$ ;

e)  $\frac{x-1}{x+2}$ ;

f)  $\frac{x+a}{x^2+a^2}$ ,  $a > 0$ ;

g)  $\frac{x^2+x}{(1-x)^3}$ ;

h)  $\ln\left(\frac{1+x}{1-x}\right)$ ;

i)  $x^2 \tan^{-1}(x^3)$ .

**Problem 2.** Find the sum of the following series:

$$(a) \sum_{n=2}^{\infty} n(n-1)x^n, \quad |x| < 1; \quad (b) \sum_{n=2}^{\infty} \frac{n^2-n}{2^n}; \quad (c) \sum_{n=1}^{\infty} \frac{n^2}{2^n}.$$

### REFERENCES

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