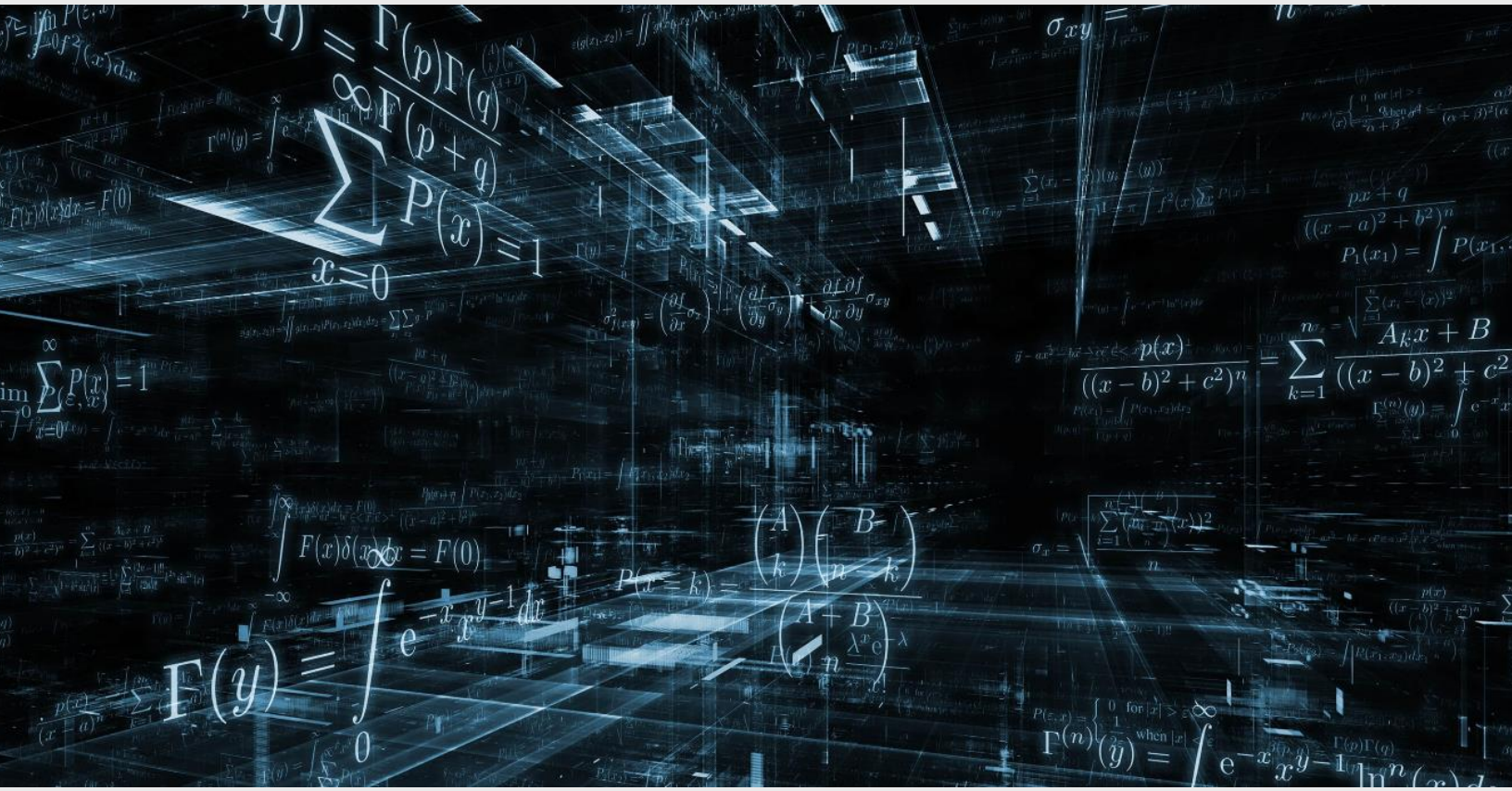
PHM212s: Complex, Special Functions and Numerical Analysis

Exercise Sheet

Series Solutions For Linear DEs



"All the world's a differential equation, and the men and women are merely variables."

-Ben Orlin

[1] Find the series solution of the DE: $(x^2+4)y''+6xy'+y=0$, **in powers of x**. *[Final Fall 2015]*

[2] Find two linearly independent series solutions **in power of x** for the following differential equation: $(x-x^2)y''+(1-5x)y'-4y=0$ *[Final Summer 2015]*

[3] Find and classify all the singularities of the following differential equation, hence, **find** its general solution **in powers of x**:

i. $(1-x^2)y''-2xy'+6y=0$ *[Midterm 2016] [Midterm 2018]*

ii. $(1-x^2)y''-2xy'+12y=0$ *[Midterm 2018] [Midterm Spring 2021]*

[4] Find the general solution **in powers of x** for:

i. $(1-x^2)y''-2xy'+2y=0$ *[Midterm 2016]*

ii. $(3-x^2)y''-xy'+16y=0$ *[Midterm 2017]*

iii. $(2-x^2)y''-xy'+25y=0$ *[Midterm 2017]*

iv. $xy''+y'+xy=0$ *[Midterm Spring 2017]*

v. $y''+4y=0$ *[Midterm Spring 2017]*