

期中考複習
for Lifescience Mathematics and Applied Mathematics

1 Taylor expansions of e^x and e^{-x} .

Linear and nonlinear regimes.

Diagrams of e^x and e^{-x} .

Why e^{-1} scale used? What is the e^{-1} scale for the function of $e^{-\alpha t}$?

Meaning and purpose of the function $e^{\alpha+i\beta}$.

Convert $a + ib$ into $re^{i\theta}$ form.

2 Eigenvalues and eigenvectors of matrix A.

Sturm-Liouville properties for the symmetric and anti-symmetric matrices.

Similarity transform and the diagonalization of matrix A.

Least square solutions.

3 Write the equation like the following into the matrix form.

$$\frac{d^2u}{dt^2} = -f^2u$$

To decouple the matrix equation.

4 Radiocarbon Dating and Newtonian cooling.

Need to know the equation and the solution, and the analysis procedures. Namely, how do we get the constant and how do we get the solution.

5 Model setting-up and formulation.

Decide on relevant independent variables, relevant dependent variables or state variables, relevant constants/parameters, and use real-world lens to find a differential equation the dependent variable satisfy.

Formulations of the differential equations in several occasions. Need to explain or to justify the term in the equation.

Identifying the Model of Competition, Model of Predation, Models of two cooperative populations, Three-species Community Models, and the Malthusian and Logistic Models. Explain the meaning of the equation set.

6 Solving for the first order differential equations.

Exact, linear, homogeneous, Bernoulli equations, integrating factor and others.