MATH 371
Homework Assignment #1

Due date/time: Jan, 17, 2022/23:59

a. Write your solutions on paper or pads, and try to keep solutions for different questions on separate pages.

b. Upload scans/photos/pdfs of your solutions to **Assign2** before the due date and time. Make sure to upload solutions to the right slot for each question.

c. Submissions after the deadline will not be graded and will result in a 0 mark.

1. Find the general solution of ordinary differential equations:
   (a) (10 points) $\dfrac{dN}{dt} = rN \quad t > 0.$
   (b) (10 points) $u'' + 3u' + 2u = 0.$

2. Find the unique solution to the initial value problem
   (a) (10 points) $y'' + 4y = 2\sin 2t, \quad y(0) = y'(0) = 0.$
   (b) (10 points) Plot the trajectory of the solution in (a). (You can use any software package. Only submit your plot.)

3. (20 points) Find the eigenvalues and eigenvectors of the following matrices.
   (a) $\begin{bmatrix} 1 & 1 \\ 3 & -1 \end{bmatrix}$, (b) $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$, (c) $\begin{bmatrix} -2 & -1 \\ 1 & -2 \end{bmatrix}$, (d) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$.

4. (20 points) Exercises 1.4.1 (page 8) and 1.4.3 in Textbook.

5. (20 points) Computation exercises 8.1.1 (page 204) and 8.1.3 (page 211). Please submit your numerical output for these questions only.