1. (20%) Given $M^3 = \begin{bmatrix} 83 & 84 \\ 42 & 41 \end{bmatrix}$, find M.

2. (15%) We can use Gauss elimination method to reduce matrix A to the reduced row echelon form R where A=$\begin{bmatrix} 1 & 2 & 3 & 1 & b \\ 2 & 5 & 3 & a & 0 \\ 1 & 8 & 0 & 6 & c \end{bmatrix}$, R=$\begin{bmatrix} 1 & 0 & 0 & -2 & 0 \\ 0 & 1 & 0 & d & -1 \\ 0 & 0 & 1 & 1 & e \end{bmatrix}$, please determine the values of a+b+c+d+e.

3. (15%) Suppose A**x**=**b**=$\begin{bmatrix} 2 \\ 0 \\ 4 \\ 10 \end{bmatrix}$, the general solution **x**=$\begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix}+c_1\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}+c_2\begin{bmatrix} -1 \\ 0 \\ 3 \end{bmatrix}$, please determine the matrix A.

4. (25%) $y'' + 2ty' - 4y = 6, y(0) = 0, y'(0) = 0,$ find $y = ?$

5. (25%) Please find the general solution to $[y(1 - x\tan(x)) + x^2\cos x]dx - xdy = 0$