1) Write a Matlab program which determines how many terms should be used in the Taylor series expansion of $\exp(z)$ around z=0 for a specific value of z to get a percentage error of less than 5 %. Execute and determine the number of necessary terms for the following values of z:

- $z = 30 + (30 \times i)$
- $z = 10 + (10\sqrt{3} \times i)$

Hint : You can use 'taylor' function of Matlab. Look in Matlab Help. There are good examples. The error is defined in terms of the magnitude.

2) Plot the magnitude of the function and the magnitude of its Taylor series expansion around z=0. The number of terms n that should be used in the Taylor series expansion is given for each function.

- $f(z) = \exp(z)$, n=40
- $f(z) = \exp(z^2)$, n=160

Hint : use 'taylor' function of Matlab. Plot these with respect to the magnitude of z. Take z=0:0.01+0.01*i:10+10*i.

3) Find the partial fraction expansion and residues of the following functions by using Matlab:

- $\frac{b(z)}{a(z)} = \frac{10z^3 + 6z^2 - 4z + 14}{-8z^3 + 16z + 6}$
- $\frac{b(z)}{a(z)} = \frac{9z^2 - 34z + 29}{z^3 - 6z^2 + 11z - 6}$

Hint : use "residue" function of Matlab.

4) Find the residues of the following functions by expanding them in Laurent series in Matlab around z=0:

- $f(z) = (\sin z - 1)/(z^4)$
- $f(z) = \cot(z)/z^4$

Hint : do the following in Matlab to get Laurent series expansion:

syms f z (Define z and f as a symbolic variable)
f=..... (Write your function)
maple('series',f,'z=0',N) (N is the maximum power you want in the expansion.)