Q.2: **(a)** To compute the Fourier transform of a sample one can use numpy.fft module. You can use **numpy.fft.fft** for 1-D, **numpy.fft.fft2** for two-dimension and **numpy.fft.fftn** to compute the N-dimensional sample.

(b) To calculate the QR Decomposition of a matrix A with python, we can make use of the built-in linalg library in scipy via the **`linalg.qr`** function.

(c) To obtain a million random numbers from a lognormal PDF, you can use **numpy.random.lognormal.**

(d) To solve IVP ODE with the 8th order Runge-Kutta method, one can use the built-in integrate library in scipy via the **scipy.integrate.DOP853**.

(e) To obtain a singular value decomposition of a matrix, one can use **numpy.linalg.svd** function in the linalg module of numpy library.

(f) To sample a higher dimensional PDF, one can use numpy.random library. It has various in-built distribution. If you have some other PDF that is not in the library then you can use our sampling methods (MCMC, Transformation, Rejection).

(g) To solve IVP ODE using adaptive size control, one can use scipy.integrate.ode().set_integrator() and choose either one of the following integrator:

1. Vode
2. Dopri5
3. Dop853

(h) To integrate a higher dimensional function using the Monte Carlo method, you can use **mcint.integrate** in python.

(i) To solve 3 coupled bvp ODE, one can use **scipy.integrate.solve_bvp**.

(j) To compute the eigenvalues and eigenvectors of any square matrix, one can use **numpy.linalg.eig.**

Q.5: If I were to select from the given libraries, I would consider the following facts:

1. **Performance:** Performance is my first preference while selecting a library. For a given task how much time will it take, will it run smoothly for given constraints.
2. **Documentation:** I would choose a library that I can use easily and whose algorithm is clear so that I can know anytime what is going on in the task.
3. **Community:** Many problems could occur when using a library, if its community is active, it will be very easy to find quickly a solution.