Project 1

- Provide your codes with appropriate comments.

- Provide a document describing your results including well-designed graphs and discussions.

- Make one .zip file to upload.

- It is an individual project, which means that your codes and document should be original.

Use
(a) Euler's method
(b) Second order Runge-Kutta
(c) Fourth order Runge-Kutta
(d) any multi-step method you choose

to approximate the solution to the differential equation

$$\frac{du}{dt} = \cos(\pi t) + u(t) \tag{1}$$

with initial condition $u(0) = 2$.

Solve this for time up to 2.0. Show a graph of the solution vs. the exact solution, and a graph of the errors for number of points $N = 10, 20, 40, 80, 160, 320, 640$. Show the effect of increasing the number of points on the error. What can you conclude about the order of the method? Comment on the behaviour you see and determine which method performed best.