

Report for RK method:

We use both Midpoint and 4th order Runge-Kutta methods to solve the IVP problems

$$y' = f(t, y), y(0) = \alpha$$

We want to practice to create fortran subprograms and implement the Midpoint method and Runge-Kutta method to solve IVP

$$y' = y - t^2 + 1, 0 \leq t \leq 2, y(0) = 0.5$$

Compare approximations to the exact solution $y(t) = (t + 1)^2 - 0.5e^t$

Output:

t	0.00	Midpt	0.500000	Err (M)	0.000000	RK4	0.500000	Err (RK4)*****
0.20		0.828000		0.001299		0.830398		0.001100
0.40		1.211360		0.002728		1.219478		0.005390
0.60		1.644659		0.004282		1.662518		0.013577
0.80		2.121284		0.005945		2.153753		0.026524
1.00		2.633167		0.007692		2.686143		0.045284
1.20		3.170464		0.009478		3.251087		0.071145
1.40		3.721165		0.011235		3.838080		0.105680
1.60		4.270622		0.012863		4.434292		0.150807
1.80		4.800959		0.014218		5.024052		0.208875