Assignment Week 11-12

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① $y''' = y' + 4y'' + e^t + yt + y''\cos(t)$

let $y = x_1$

$y' = x_1' = x_2$

$y'' = x_1'' = x_2' = x_3$

$y''' = x_1''' = x_2'' = x_3' = x_4$

$y'''' = x_1'''' = x_2''' = x_3'' = x_4' = x_5$

$x_5 = x_2 + 4x_3 + e^t + x_1 t + x_4\cos(t)$

$$\begin{pmatrix} x_2 \\ x_3 \\ x_4 \\ x_5 \end{pmatrix} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ t & 1 & 4 & \cos(t) \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \\ 0 \\ e^t \end{pmatrix}$$

② main_tut.m

③ scenario3.m

④ RK4.m

main.m

⑤ ODE45 can be used to improve on the solution provided by RK4. ODE45 uses explicit adaptive step sizes and a paired 4th & 5th order RK method.

	RK4	Ode45	Absolute error
Y(1)	26.8767	28.3515	1.4748
y(2)	58.9068	61.9850	3.0782
y(3)	118.477	124.4754	6.0047
y(4)	223.32283	234.47785	11.15002