

NUMERICAL ANALYSIS

7

조혜성

1. Initial Value Problem 풀기

Example) $y' = 4e^{0.8x} - 0.5y$ 인 함수 $x=4$ 에서의 적분 값을 구하라.

구간 간격은 1 이고 초기 값은 $x = 0$ 에서 $y = 2$.

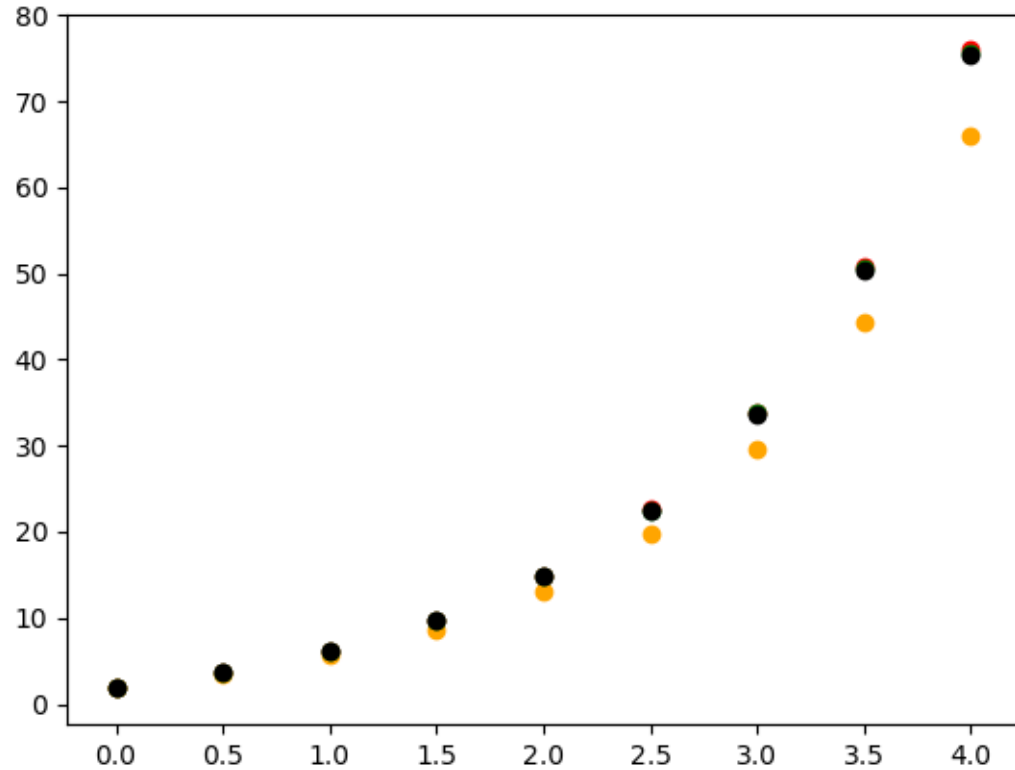
Heun, Euler, Midpoint , 4th-Runge-Kutta

1. Initial Value Problem 풀기

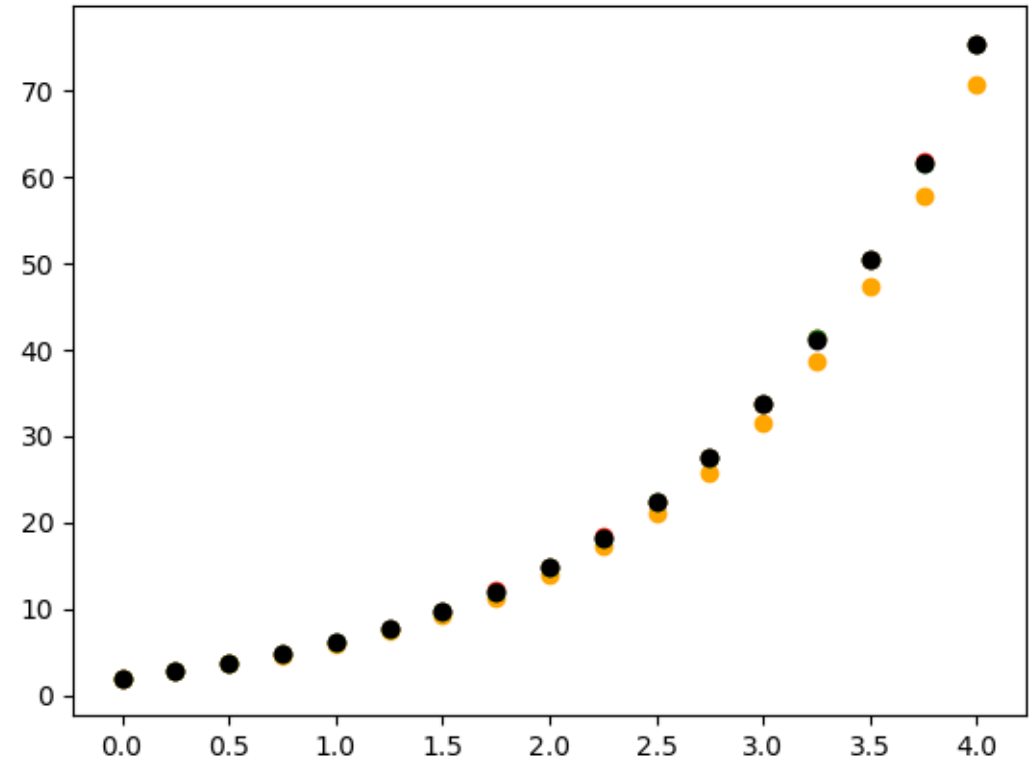
Heun	Euler	Midpoint	RK4
h is 0.500000 75.95170535	66.07136051	75.55571416	75.34533606
h is 0.250000 75.49303155	70.71612469	75.39971288	75.33936003
h is 0.125000 75.37753547	73.03227316	75.35490575	75.33898735
h is 0.062500 75.34860931	74.18704072	75.34303854	75.33896415
h is 0.031250 75.34137450	74.76338686	75.33999258	75.33896271
h is 0.015625 75.33956560	75.05127468	75.33922146	75.33896262
h is 0.007812 75.33911336	75.19514409	75.33902749	75.33896261
h is 0.003906 75.33900030	75.26705976	75.33897885	75.33896261
h is 0.001953 75.33897203	75.30301280	75.33896667	75.33896261
h is 0.000977 75.33896496	75.32098811	75.33896363	75.33896261
h is 0.000488 75.33896320	75.32997546	75.33896286	75.33896261
h is 0.000244 75.33896276	75.33446906	75.33896267	75.33896261
h is 0.000122 75.33896265	75.33671584	75.33896263	75.33896261
h is 0.000061 75.33896262	75.33783923	75.33896261	75.33896261
h is 0.000031 75.33896261	75.33840092	75.33896261	75.33896261
h is 0.000015 75.33896261	75.33868176	75.33896261	75.33896261

2. PLOT

Heun = red, Euler = orange,
Midpoint= green, RK4 = black



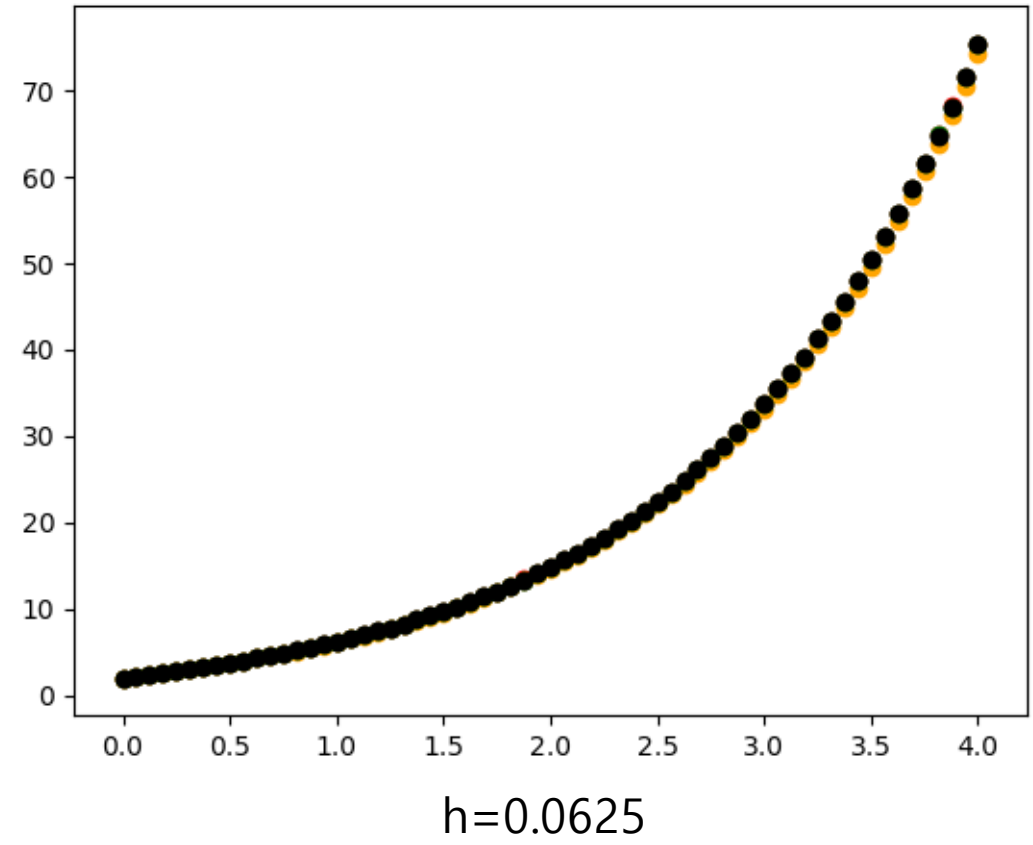
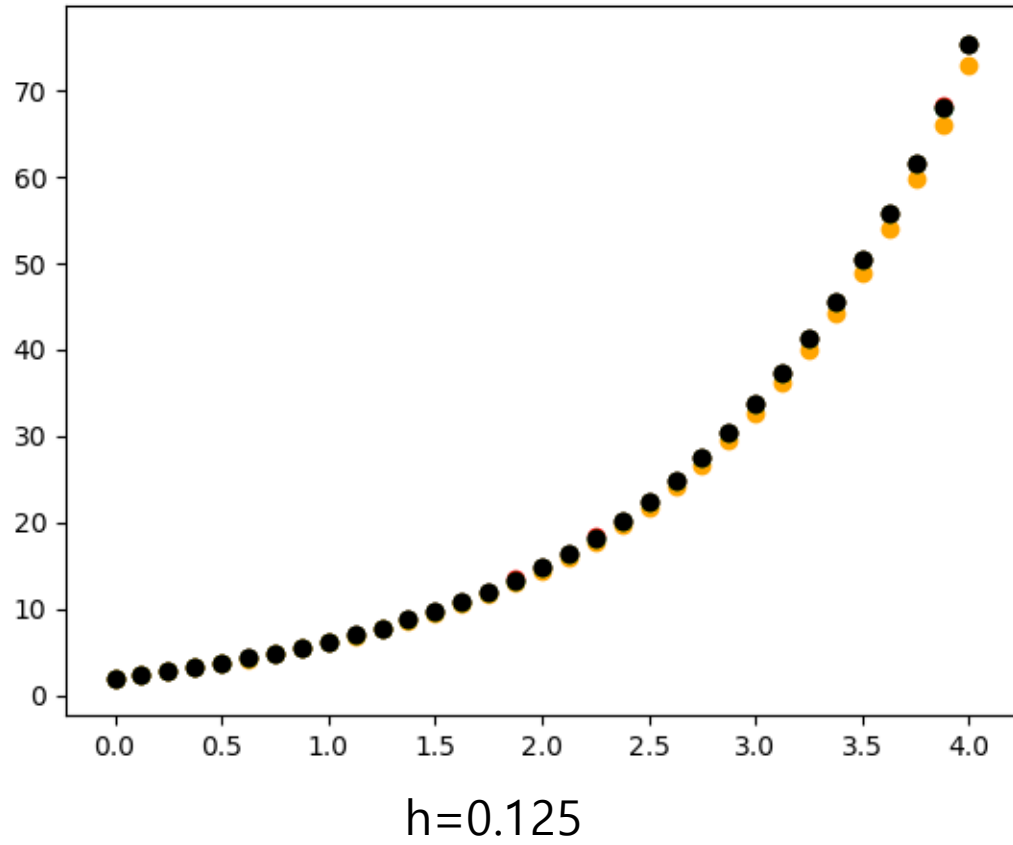
$h=0.5$



$h=0.25$

2. PLOT

Heun = red, Euler = orange,
Midpoint= green, RK4 = black

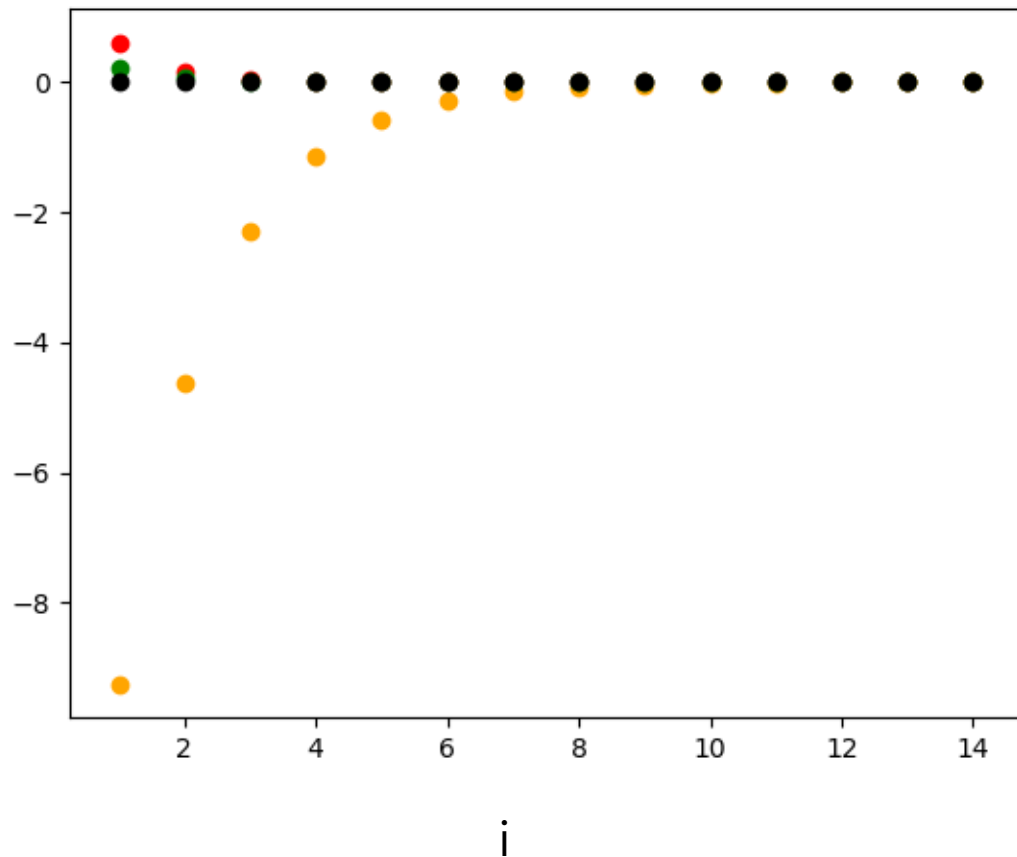


3. Error Evaluation

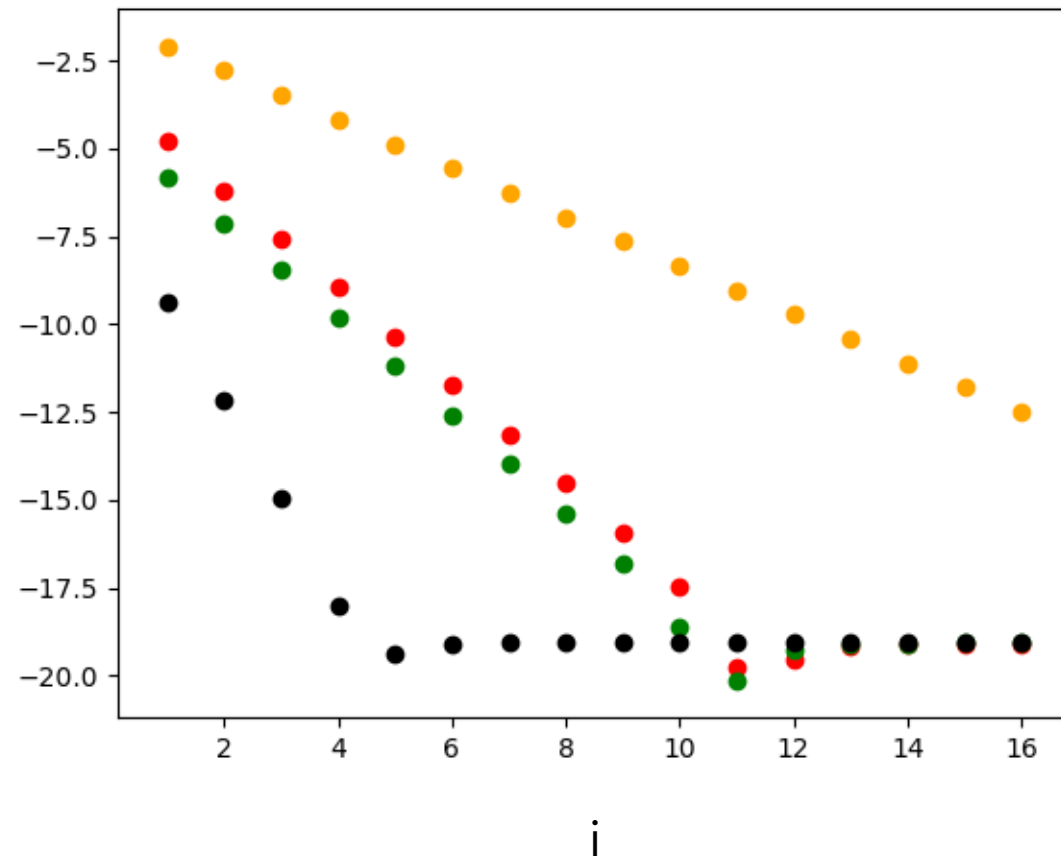
구간을 0.5^i 로 나눴을 때

Heun = red, Euler = orange,
Midpoint = green, RK4 = black

error



Log(relative err)



Example) $y' = 4e^{0.8x} - 0.5y$ 인 함수 $x=4$ 에서의 적분 값을 구하라.

구간 간격은 1 이고 초기 값은 $x = 0$ 에서 $y = 2$.

Euler <<Heun < Midpoint << 4th-Runge-Kutta

Thank You

