

數值方法作業五

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Question1_a

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Desktop/F54091196_numerical_hw5/question1_a.py
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t	Euler y	Exact y	Error
1.00	0.00000	0.00000	0.00000
1.10	0.10000	0.10516	0.00516
1.20	0.20992	0.22124	0.01133
1.30	0.33047	0.34912	0.01865
1.40	0.46235	0.48968	0.02733
1.50	0.60629	0.64388	0.03759
1.60	0.76304	0.81275	0.04971
1.70	0.93348	0.99749	0.06402
1.80	1.11854	1.19944	0.08090
1.90	1.31929	1.42012	0.10082
2.00	1.53694	1.66128	0.12434

Question1_b:

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Desktop/F54091196_numerical_hw5/question1_b.py
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t	Taylor y	Exact y	Error
1.00	0.00000	0.00000	0.00000
1.10	0.10000	0.10516	0.00516
1.20	0.20943	0.22124	0.01181
1.30	0.32895	0.34912	0.02017
1.40	0.45919	0.48968	0.03049
1.50	0.60080	0.64388	0.04307
1.60	0.75450	0.81275	0.05826
1.70	0.92103	0.99749	0.07647
1.80	1.10124	1.19944	0.09820
1.90	1.29607	1.42012	0.12405
2.00	1.50657	1.66128	0.15471

Question2

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Desktop/F54091196_numerical_hw5/question2.py
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Step size h = 0.1

t	u1 (RK4)	u1 (Exact)	Error u1	u2 (RK4)	u2 (Exact)	Error u2
0.00	1.33333	1.33333	0.00000e+00	0.66667	0.66667	1.11022e-16
0.10	-3.05244	1.79306	4.84550e+00	8.98931	-1.03200	1.00213e+01
0.20	-23.84779	1.42390	2.52717e+01	51.19270	-0.87468	5.20674e+01
0.30	-130.16520	1.13158	1.31297e+02	269.26919	-0.72500	2.69994e+02
0.40	-680.23149	0.90941	6.81141e+02	1399.36858	-0.60821	1.39998e+03
0.50	-3531.29959	0.73879	3.53204e+03	7258.24184	-0.51566	7.25876e+03
0.60	-18312.79505	0.60571	1.83134e+04	37634.95548	-0.44041	3.76354e+04
0.70	-94951.33191	0.49986	9.49518e+04	195131.87174	-0.37740	1.95132e+05
0.80	-492306.46564	0.41367	4.92307e+05	1011721.87208	-0.32295	1.01172e+06
0.90	-2552513.62387	0.34161	2.55251e+06	5245578.82659	-0.27441	5.24558e+06
1.00	-13234278.78917	0.27967	1.32343e+07	27197287.20659	-0.22989	2.71973e+07

Step size h = 0.05							
t	u1 (RK4)	u1 (Exact)	Error u1		u2 (RK4)	u2 (Exact)	Error u2
0.00	1.33333	1.33333	0.00000e+00		0.66667	0.66667	1.11022e-16
0.05	1.72188	1.91206	1.90178e-01		-0.49960	-0.90908	4.09477e-01
0.10	1.72692	1.79306	6.61475e-02		-0.83260	-1.03200	1.99405e-01
0.15	1.61716	1.60197	1.51939e-02		-0.89037	-0.96146	7.10857e-02
0.20	1.48169	1.42390	5.77849e-02		-0.86104	-0.87468	1.36389e-02
0.25	1.34895	1.26765	8.12994e-02		-0.80750	-0.79522	1.22838e-02
0.30	1.22706	1.13158	9.54868e-02		-0.75034	-0.72500	2.53421e-02
0.35	1.11748	1.01300	1.04480e-01		-0.69589	-0.66306	3.28263e-02
0.40	1.01953	0.90941	1.10117e-01		-0.64573	-0.60821	3.75176e-02
0.45	0.93198	0.81863	1.13347e-01		-0.59993	-0.55939	4.05450e-02
0.50	0.85354	0.73879	1.14753e-01		-0.55809	-0.51566	4.24348e-02
0.55	0.78302	0.66827	1.14743e-01		-0.51971	-0.47622	4.34815e-02
0.60	0.71934	0.60571	1.13627e-01		-0.48429	-0.44041	4.38795e-02
0.65	0.66156	0.54991	1.11651e-01		-0.45141	-0.40764	4.37717e-02
0.70	0.60887	0.49986	1.09007e-01		-0.42067	-0.37740	4.32688e-02
0.75	0.56055	0.45469	1.05852e-01		-0.39175	-0.34930	4.24586e-02
0.80	0.51598	0.41367	1.02309e-01		-0.36436	-0.32295	4.14112e-02
0.85	0.47463	0.37616	9.84749e-02		-0.33826	-0.29808	4.01825e-02
0.90	0.43604	0.34161	9.44283e-02		-0.31323	-0.27441	3.88173e-02
0.95	0.39981	0.30958	9.02293e-02		-0.28909	-0.25174	3.73506e-02
1.00	0.36560	0.27967	8.59249e-02		-0.26570	-0.22989	3.58102e-02