

HW5

1.(a) t Euler Exact Error (Euler)

1.0	0.000000	0.000000	0.000000
1.1	0.100000	0.105160	0.005160
1.2	0.209917	0.221243	0.011325
1.3	0.330471	0.349121	0.018651
1.4	0.462354	0.489682	0.027328
1.5	0.606285	0.643875	0.037590
1.6	0.763041	0.812753	0.049711
1.7	0.933475	0.997494	0.064019
1.8	1.118537	1.199439	0.080902
1.9	1.319293	1.420116	0.100823
2.0	1.536943	1.661282	0.124338

(b) t Taylor 2nd Exact Error (Taylor 2nd)

1.0	0.000000	0.000000	0.000000
1.1	0.105000	0.105160	0.000160
1.2	0.220919	0.221243	0.000324
1.3	0.348612	0.349121	0.000509
1.4	0.488954	0.489682	0.000728
1.5	0.642883	0.643875	0.000993
1.6	0.811438	0.812753	0.001315
1.7	0.995787	0.997494	0.001707
1.8	1.197252	1.199439	0.002187
1.9	1.417344	1.420116	0.002772

2.0 1.657795 1.661282 0.003487

2. ===== RK4 結果 (h = 0.05) =====

t	u1_RK4	u1_exact	err_u1	u2_RK4	u2_exact	err_u2

0.00	1.33333333	1.33333333	0.00e+00	0.66666667	0.66666667	1.11e-16
0.05	1.72188026	1.91205863	1.90e-01	-0.49959934	-0.90907659	4.09e-01
0.10	1.72691505	1.79306259	6.61e-02	-0.83259771	-1.03200245	1.99e-01
0.15	1.61716063	1.60196676	1.52e-02	-0.89037299	-0.96145871	7.11e-02
0.20	1.48168729	1.42390240	5.78e-02	-0.86104209	-0.87468103	1.36e-02
0.25	1.34894503	1.26764562	8.13e-02	-0.80750453	-0.79522077	1.23e-02
0.30	1.22706330	1.13157652	9.55e-02	-0.75034063	-0.72499857	2.53e-02
0.35	1.11747812	1.01299856	1.04e-01	-0.69588591	-0.66305963	3.28e-02
0.40	1.01952546	0.90940859	1.10e-01	-0.64573176	-0.60821421	3.75e-02
0.45	0.93197667	0.81862953	1.13e-01	-0.59993424	-0.55938925	4.05e-02
0.50	0.85354051	0.73878784	1.15e-01	-0.55809249	-0.51565767	4.24e-02
0.55	0.78301727	0.66827466	1.15e-01	-0.51970627	-0.47622475	4.35e-02
0.60	0.71933702	0.60570965	1.14e-01	-0.48429030	-0.44041076	4.39e-02
0.65	0.66156029	0.54990941	1.12e-01	-0.45140706	-0.40763534	4.38e-02
0.70	0.60886766	0.49986025	1.09e-01	-0.42067262	-0.37740382	4.33e-02
0.75	0.56054684	0.45469474	1.06e-01	-0.39175408	-0.34929551	4.25e-02
0.80	0.51598005	0.41367148	1.02e-01	-0.36436468	-0.32295352	4.14e-02
0.85	0.47463257	0.37615771	9.85e-02	-0.33825859	-0.29807605	4.02e-02
0.90	0.43604262	0.34161435	9.44e-02	-0.31322610	-0.27440884	3.88e-02
0.95	0.39981231	0.30958300	9.02e-02	-0.28908926	-0.25173868	3.74e-02

1.00 | 0.36559983 | 0.27967491 | 8.59e-02 || -0.26569799 | -0.22988784 | 3.58e-02

===== RK4 結果 (h = 0.1) =====

t	u1_RK4	u1_exact	err_u1	u2_RK4	u2_exact	err_u2

0.00	1.33333333	1.33333333	0.00e+00	0.66666667	0.66666667	1.11e-16
0.10	-3.05243707	1.79306259	4.85e+00	8.98930534	-1.03200245	1.00e+01
0.20	-23.84779486	1.42390240	2.53e+01	51.19270400	-0.87468103	5.21e+01
0.30	-130.16520171	1.13157652	1.31e+02	269.26919317	-0.72499857	2.70e+02
0.40	-680.23148509	0.90940859	6.81e+02	1399.36858350	-0.60821421	1.40e+03
0.50	-3531.29958537	0.73878784	3.53e+03	7258.24183884	-0.51565767	7.26e+03
0.60	-18312.79505221	0.60570965	1.83e+04	37634.95548298	-0.44041076	3.76e+04
0.70	-94951.33190728	0.49986025	9.50e+04	195131.87173536	-0.37740382	1.95e+05
0.80	-492306.46563948	0.41367148	4.92e+05	1011721.87207795	-0.32295352	1.01e+06
0.90	-2552513.62386741	0.34161435	2.55e+06	5245578.82658988	-0.27440884	5.25e+06
1.00	-13234278.78916787	0.27967491	1.32e+07	27197287.20658695	-0.22988784	2.72e+07
1.00	-13234278.78916781	0.27967491	1.32e+07	27197287.20658683	-0.22988784	2.72e+07