1.

```
=== Euler Method 結果 ===
      t   Euler y   Exact y     Error
0   1.0  0.000000  0.000000  0.000000
1   1.1  0.100000  0.105160  0.005160
2   1.2  0.209917  0.221243  0.011325
3   1.3  0.330471  0.349121  0.018651
4   1.4  0.462354  0.489682  0.027328
5   1.5  0.606285  0.643875  0.037590
6   1.6  0.763041  0.812753  0.049711
7   1.7  0.933475  0.997494  0.064019
8   1.8  1.118537  1.199439  0.080902
9   1.9  1.319293  1.420116  0.100823
10  2.0  1.536943  1.661282  0.124338
```
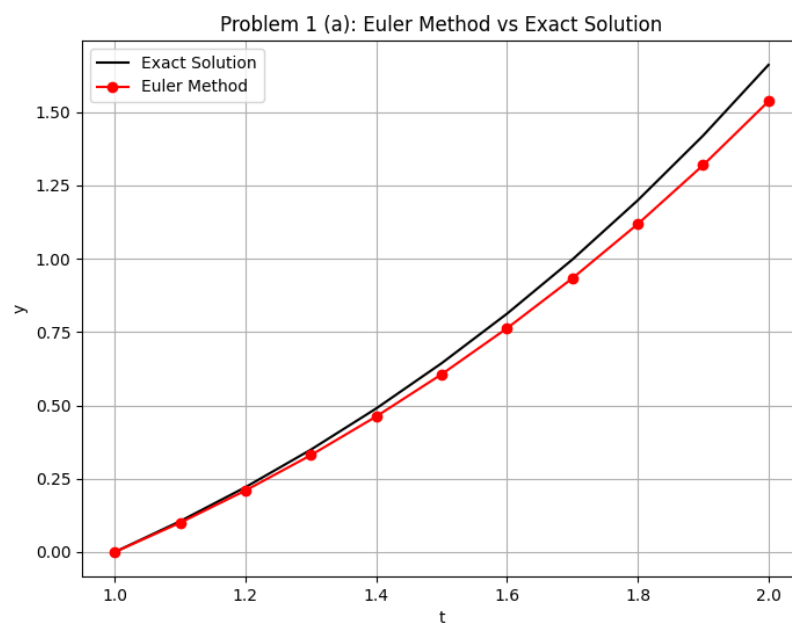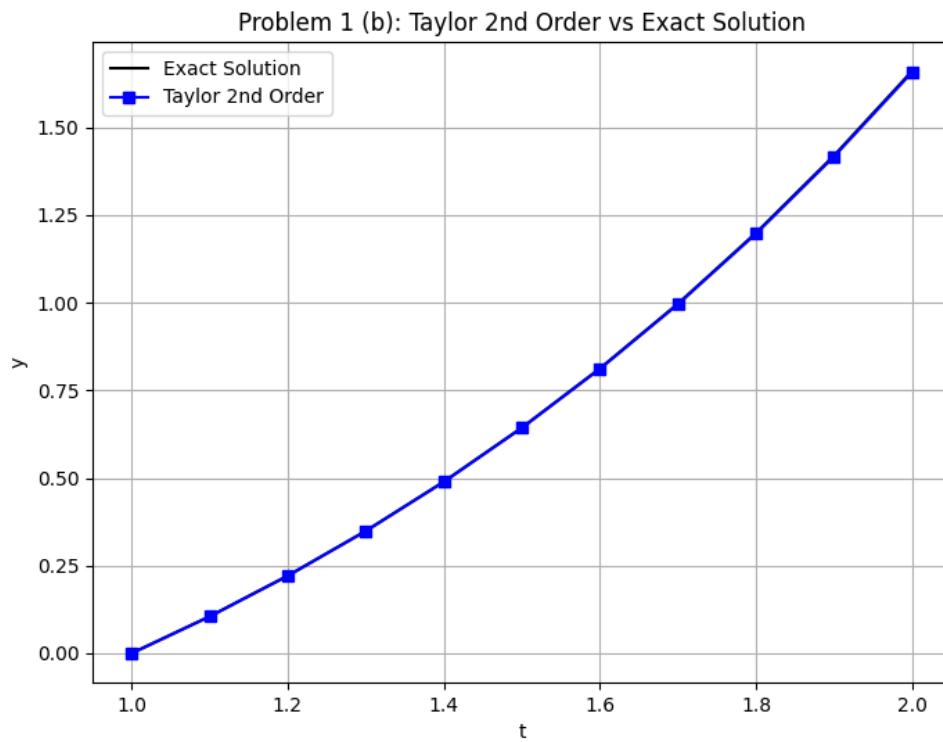
```
=== Taylor 2nd Order Method 結果 ===
      t  Taylor y   Exact y     Error
0   1.0  0.000000  0.000000  0.000000
1   1.1  0.105000  0.105160  0.000160
2   1.2  0.220919  0.221243  0.000324
3   1.3  0.348612  0.349121  0.000509
4   1.4  0.488954  0.489682  0.000728
5   1.5  0.642883  0.643875  0.000993
6   1.6  0.811438  0.812753  0.001315
7   1.7  0.995787  0.997494  0.001707
8   1.8  1.197252  1.199439  0.002187
9   1.9  1.417344  1.420116  0.002772
10  2.0  1.657795  1.661282  0.003487
```


Problem 1 (a): Euler Method vs Exact Solution

Problem 1 (b): Taylor 2nd Order vs Exact Solution

2.

```
RK4 Method (h = 0.05)
         t    u1_exact     u1_RK4     err_u1    u2_exact      u2_RK4     err_u2
 0.00000000 1.33333333 1.33333333 0.00000000  0.66666667  0.66666667 0.00000000
 0.05000000 1.91205863 1.72188026 0.19017837 -0.90907659 -0.49959934 0.40947725
 0.10000000 1.79306259 1.72691505 0.06614754 -1.03200245 -0.83259770 0.19940475
 0.15000000 1.60196676 1.61716064 0.01519388 -0.96145871 -0.89037299 0.07108572
 0.20000000 1.42390240 1.48168729 0.05778489 -0.87468103 -0.86104209 0.01363894
 0.25000000 1.26764562 1.34894503 0.08129941 -0.79522077 -0.80750453 0.01228376
 0.30000000 1.13157652 1.22706330 0.09548678 -0.72499857 -0.75034063 0.02534206
 0.35000000 1.01299856 1.11747812 0.10447956 -0.66305963 -0.69588591 0.03282628
 0.40000000 0.90940859 1.01952546 0.11011687 -0.60821421 -0.64573176 0.03751755
 0.45000000 0.81862953 0.93197667 0.11334714 -0.55938925 -0.59993424 0.04054499
 0.50000000 0.73878784 0.85354051 0.11475267 -0.51565767 -0.55809249 0.04243482
 0.55000000 0.66827466 0.78301728 0.11474262 -0.47622475 -0.51970627 0.04348152
 0.60000000 0.60570965 0.71933702 0.11362737 -0.44041076 -0.48429031 0.04387955
 0.65000000 0.54990941 0.66156029 0.11165088 -0.40763534 -0.45140706 0.04377172
 0.70000000 0.49986025 0.60886767 0.10900742 -0.37740382 -0.42067262 0.04326880
 0.75000000 0.45469474 0.56054685 0.10585211 -0.34929551 -0.39175408 0.04245857
 0.80000000 0.41367148 0.51598005 0.10230857 -0.32295352 -0.36436468 0.04141116
 0.85000000 0.37615771 0.47463258 0.09847487 -0.29807605 -0.33825859 0.04018254
 0.90000000 0.34161435 0.43604262 0.09442827 -0.27440884 -0.31322611 0.03881727
 0.95000000 0.30958300 0.39981231 0.09022931 -0.25173868 -0.28908926 0.03735058
 1.00000000 0.27967491 0.36559983 0.08592492 -0.22988784 -0.26569799 0.03581015
```

```
RK4 Method (h = 0.1)
         t   u1_exact           u1_RK4          err_u1   u2_exact              u2_RK4          err_u2
0.00000000 1.33333333       1.33333333      0.00000000 0.66666667          0.66666667      0.00000000
0.10000000 1.79306259      -3.05243707      4.84549966 -1.03200245         8.98930534     10.02130779
0.20000000 1.42390240     -23.84779485     25.27169725 -0.87468103        51.19270398     52.06738501
0.30000000 1.13157652    -130.16520165    131.29677817 -0.72499857       269.26919305    269.99419162
0.40000000 0.90940859    -680.23148478    681.14089337 -0.60821421      1399.36858287   1399.97679708
0.50000000 0.73878784   -3531.29958377   3532.03837161 -0.51565767      7258.24183557   7258.75749324
0.60000000 0.60570965  -18312.79504397  18313.40075362 -0.44041076     37634.95546604  37635.39587680
0.70000000 0.49986025  -94951.33186455  94951.83172480 -0.37740382    195131.87164756 195132.24905138
0.80000000 0.41367148 -492306.46541798 492306.87908946 -0.32295352   1011721.87162274 1011722.19457626
0.90000000 0.34161435 -2552513.62271895 2552513.96433330 -0.27440884  5245578.82422970 5245579.09863854
1.00000000 0.27967491 -13234278.78321329 13234279.06288820 -0.22988784 27197287.19434988 27197287.42423772
```


u1 vs RK4 (h=0.1)

u2 vs RK4 (h=0.05)