

Problem 1

(a) Euler's Method ($h = 0.1$)			
t	Euler_y	Exact_y	Error
1.00	0.000000	0.000000	0.000000
1.10	0.100000	0.105160	0.005160
1.20	0.209917	0.221243	0.011325
1.30	0.330471	0.349121	0.018651
1.40	0.462354	0.489682	0.027328
1.50	0.606285	0.643875	0.037590
1.60	0.763041	0.812753	0.049711
1.70	0.933475	0.997494	0.064019
1.80	1.118537	1.199439	0.080902
1.90	1.319293	1.420116	0.100823
2.00	1.536943	1.661282	0.124338

(b) Taylor's Method of Order 2 ($h = 0.1$)			
t	Taylor_y	Exact_y	Error
1.00	0.000000	0.000000	0.000000
1.10	0.105000	0.105160	0.000160
1.20	0.220919	0.221243	0.000324
1.30	0.348612	0.349121	0.000509
1.40	0.488954	0.489682	0.000728
1.50	0.642883	0.643875	0.000993
1.60	0.811438	0.812753	0.001315
1.70	0.995787	0.997494	0.001707
1.80	1.197252	1.199439	0.002187
1.90	1.417344	1.420116	0.002772
2.00	1.657795	1.661282	0.003487

Problem 2

Results for $h = 0.05$							
t	u1_RK	u1_exact	err_u1	u2_RK	u2_exact	err_u2	
0.000000000	1.333333333	1.333333333	0.000000000	0.666666667	0.666666667	0.000000000	
0.050000000	1.721880259	1.912058634	0.190178375	-0.499593433	-0.909076586	0.409477243	
0.100000000	1.726915046	1.793062585	0.066147538	-0.832597705	-1.032002452	0.199404747	
0.150000000	1.617160632	1.601966763	0.015193868	-0.890372992	-0.961458712	0.071085720	
0.200000000	1.481687285	1.423902396	0.057784889	-0.861042085	-0.874681025	0.013638939	
0.250000000	1.348945029	1.267645618	0.081299411	-0.807504526	-0.795220770	0.012283756	
0.300000000	1.227063305	1.131576522	0.095486778	-0.750340627	-0.724998568	0.025342059	
0.350000000	1.117478124	1.012998558	0.104479569	-0.695885913	-0.663059626	0.032826287	
0.400000000	1.019525459	0.909408587	0.110116872	-0.645731757	-0.608214207	0.037517550	
0.450000000	0.931976666	0.818629531	0.113347134	-0.599934240	-0.559389247	0.040544993	
0.500000000	0.853540506	0.738787837	0.114752669	-0.558092491	-0.515657674	0.042434817	
0.550000000	0.783017271	0.668274657	0.114742614	-0.519706270	-0.476224748	0.043481522	
0.600000000	0.719337015	0.605709648	0.113627367	-0.484290304	-0.440410759	0.043879545	
0.650000000	0.661560286	0.549909409	0.111650876	-0.451407061	-0.407635337	0.043771723	
0.700000000	0.608867664	0.499860252	0.109007412	-0.420672619	-0.377403824	0.043268795	
0.750000000	0.560546844	0.454694738	0.105852106	-0.391754082	-0.349295514	0.042458568	
0.800000000	0.515980048	0.413671476	0.102308571	-0.364364680	-0.322953523	0.041411157	
0.850000000	0.474632573	0.376157714	0.098474859	-0.338258592	-0.298076048	0.040182544	
0.900000000	0.436042616	0.341614348	0.094428268	-0.313226104	-0.274408835	0.038817268	
0.950000000	0.399812306	0.309583004	0.090229301	-0.289089256	-0.251738684	0.037350576	
1.000000000	0.365998291	0.279674905	0.085924923	-0.265697991	-0.229887837	0.035810154	

Results for $h = 0.1$							
t	u1_RK	u1_exact	err_u1	u2_RK	u2_exact	err_u2	
0.000000000	1.333333333	1.333333333	0.000000000	0.666666667	0.666666667	0.000000000	
0.100000000	-3.052437068	1.793062585	4.845499653	8.989305342	-1.032002452	10.021307795	
0.200000000	-23.847794861	1.423902396	25.271697258	51.192704003	-0.874681025	52.067385029	
0.300000000	-130.165201714	1.131576522	131.296778236	269.269193174	-0.724998568	269.994191742	
0.400000000	-680.231485091	0.909408587	681.140893678	1399.368583502	-0.608214207	1399.976797709	
0.500000000	-3531.299585366	0.738787837	3532.038373204	7258.241838835	-0.515657674	7258.757496512	
0.600000000	-18312.795052212	0.605709648	18313.400761860	37634.955482975	-0.440410759	37635.395893735	
0.700000000	-94951.331907280	0.499860252	94951.831767532	195131.871735359	-0.377403824	195132.249139183	
0.800000000	-492306.465639484	0.413671476	492306.879310961	1011721.872077950	-0.322953523	1011722.195031473	
0.900000000	-2552513.623867414	0.341614348	2552513.965481763	5245578.826589883	-0.274408835	5245579.100998719	
1.000000000	-13234278.789167903	0.279674905	13234279.068842806	27197287.206586994	-0.229887837	27197287.436474829	