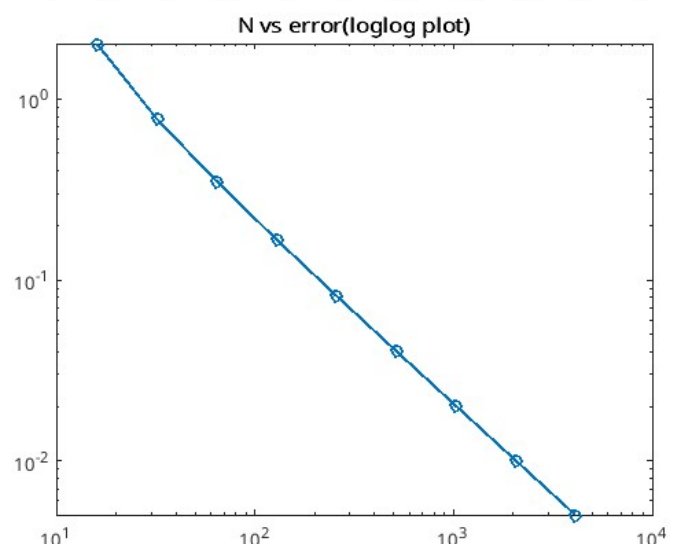
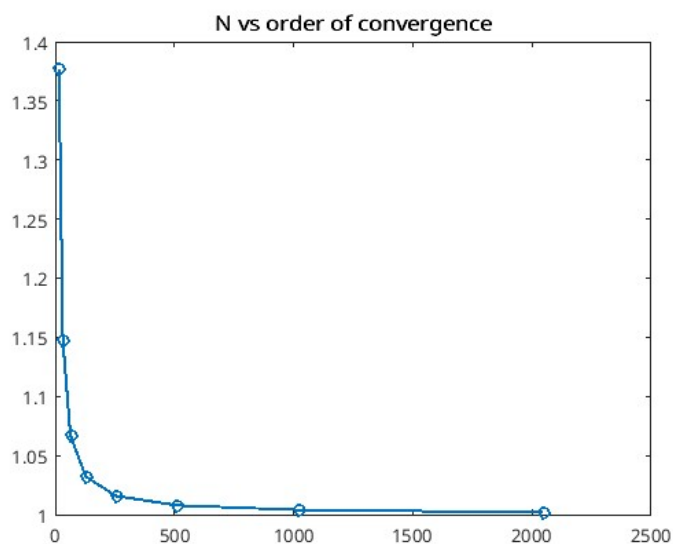
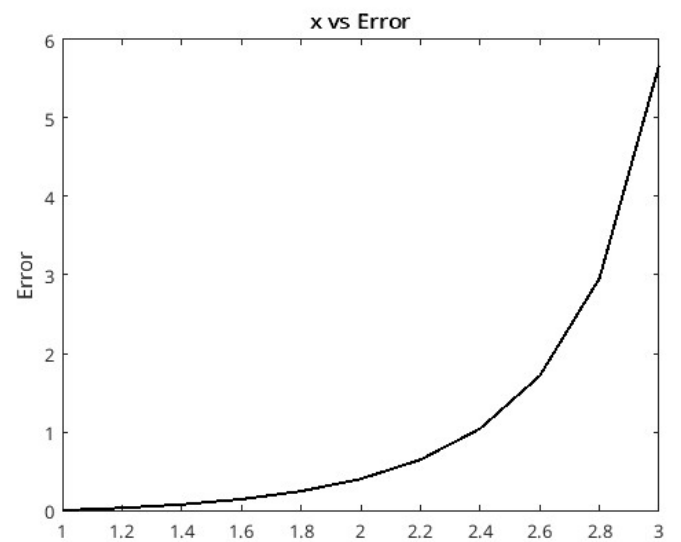
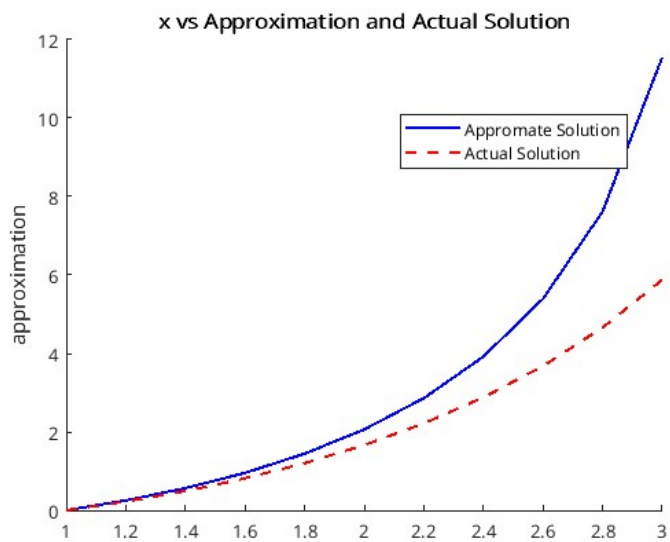


Q1)

(a)

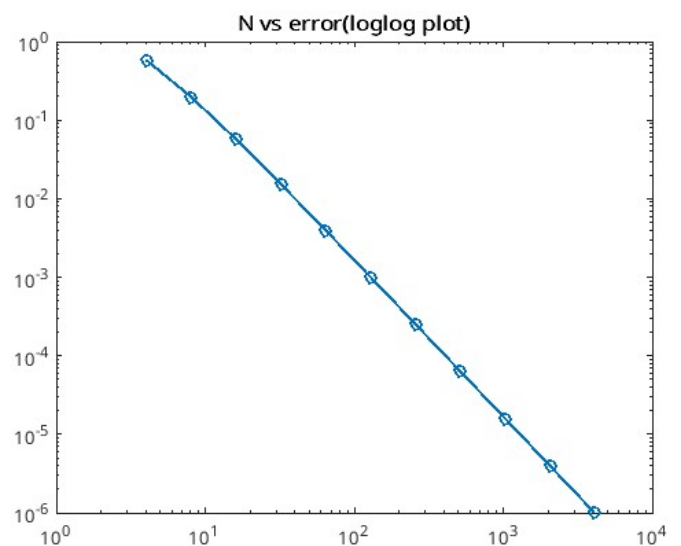
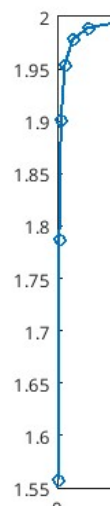
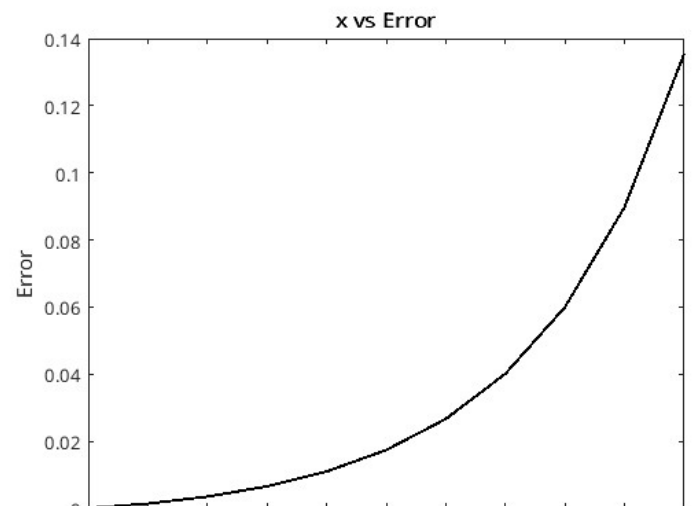
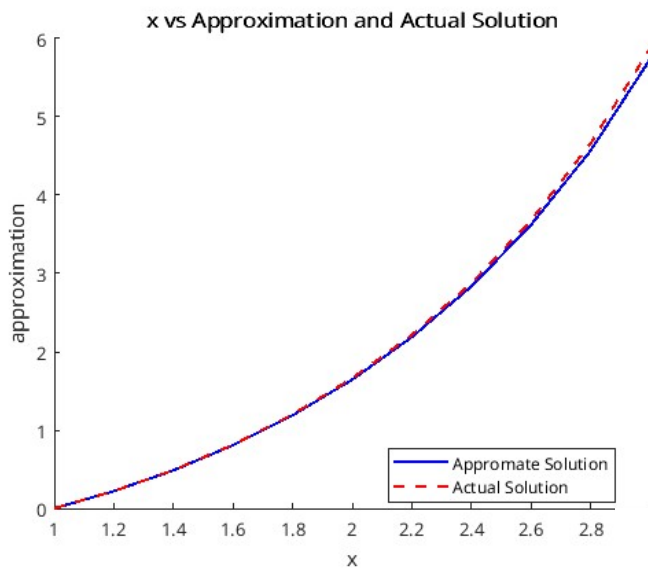
Implicit Euler:

Implicit Euler Method:			
t	approximation	actual	error
1	0	0	0
1.2	0.250454583026496	0.221242772757631	0.0292118102688649
1.4	0.563305747476104	0.489681663750943	0.0736240837251615
1.6	0.95352968025127	0.812752740561542	0.140776939689727
1.8	1.4421515146776	1.19943864032594	0.242712874351662
2	2.06047770329629	1.66128175572157	0.39919594757472
2.2	2.85773744096705	2.21350181348063	0.644235627486413
2.4	3.91683450001299	2.87655141999484	1.04028308001815
2.6	5.39162138733281	3.67847533085185	1.71314605648097
2.8	7.61470635189775	4.65866505823951	2.95604129365824
3	11.5481105505512	5.87409997818417	5.67401057236705



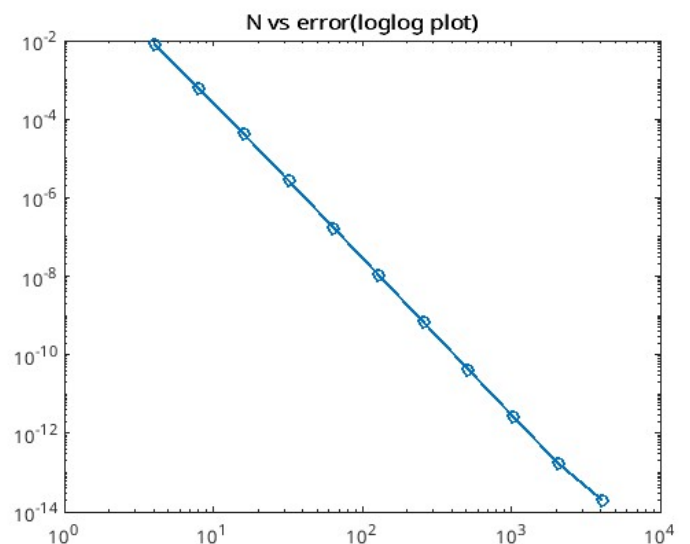
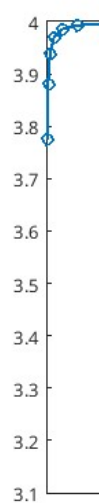
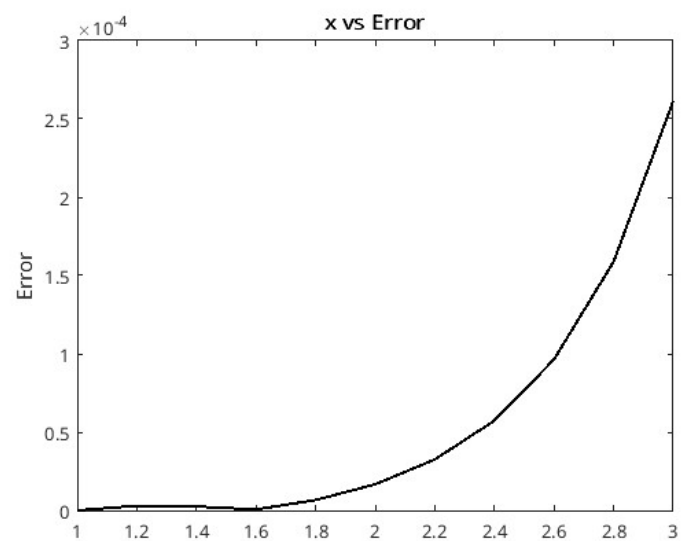
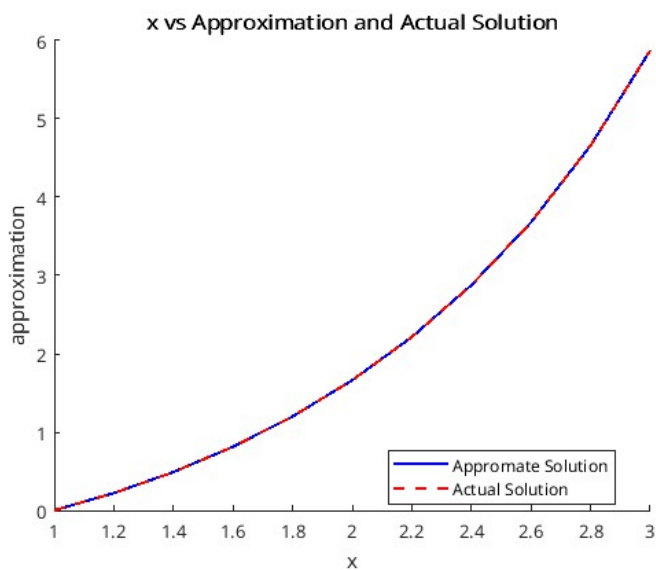
Runge Kutta 2nd Order

t	approximation	actual	error
1	0	0	0
1.2	0.219834710743802	0.221242772757631	0.00140806201382948
1.4	0.486177046768206	0.489681663750943	0.00350461698273657
1.6	0.806184891605961	0.812752740561542	0.00656784895558093
1.8	1.18843925837304	1.19943864032594	0.0109993819529002
2	1.64388892124877	1.66128175572157	0.0173928344727998
2.2	2.18686089286093	2.21350181348063	0.0266409206197
2.4	2.83643571306701	2.87655141999484	0.0401157069278355
2.6	3.61849255493937	3.67847533085185	0.0599827759124798
2.8	4.56889438371891	4.65866505823951	0.0897706745206071
3	5.73864746521413	5.87409997818417	0.135452512970037



Runge Kutta 4th order

t	approximation	actual	error
1	0	0	0
1.2	0.221245707288813	0.221242772757631	2.9345311814144e-06
1.4	0.489684166443365	0.489681663750943	2.50269242257906e-06
1.6	0.81275216202401	0.812752740561542	5.7853753210324e-07
1.8	1.19943202163924	1.19943864032594	6.61868670004395e-06
2	1.66126511544869	1.66128175572157	1.66402728811743e-05
2.2	2.21346931657636	2.21350181348063	3.24969042724277e-05
2.4	2.87649411454154	2.87655141999484	5.73054533026252e-05
2.6	3.67837899609925	3.67847533085185	9.63347525999581e-05
2.8	4.65850628368228	4.65866505823951	0.000158774557231567
3	5.87383856983279	5.87409997818417	0.000261408351379444

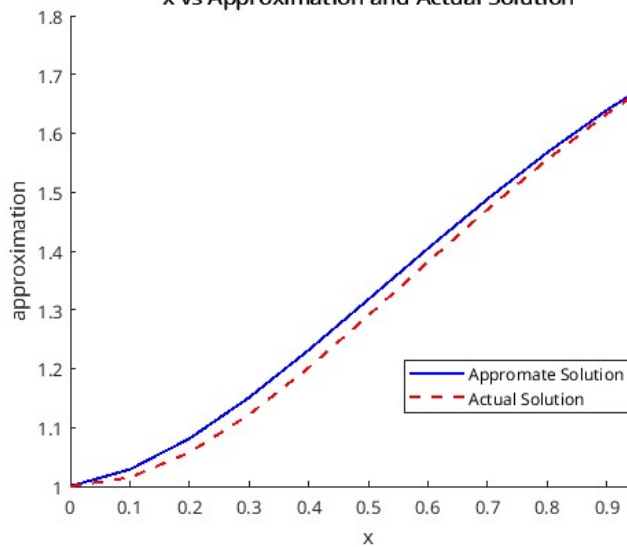


(b)

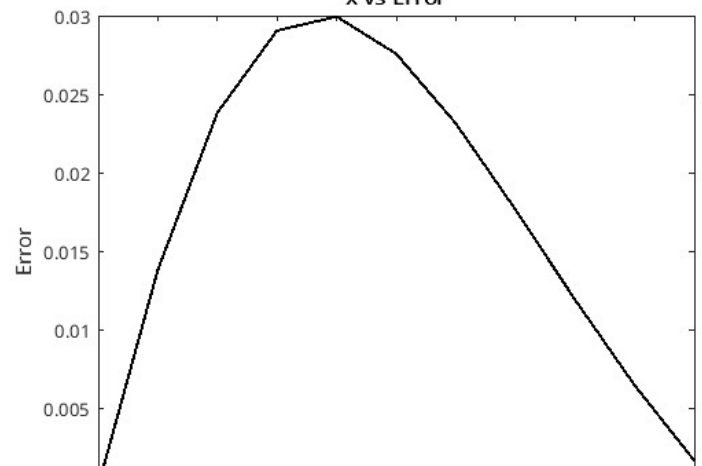
Implicit Euler:

Implicit Euler Method:			
t	approximation	actual	error
0	1	1	0
0.1	1.02860172615079	1.01481549985822	0.0137862262925679
0.2	1.08098831062131	1.0571810074642	0.0238073031571016
0.3	1.15074609870334	1.12169801826798	0.0290480804353561
0.4	1.2314205216256	1.2014860103644	0.0299345112611962
0.5	1.31736970673967	1.28980527630561	0.0275644304340572
0.6	1.40405913082249	1.38093121544373	0.0231279153787602
0.7	1.48805948728035	1.47041518539722	0.0176443018831272
0.8	1.5669267611553	1.55503142343518	0.0118953377201196
0.9	1.63905137779954	1.63261318178287	0.00643819601667794
1	1.7035097441446	1.70187005276128	0.00163969138332076

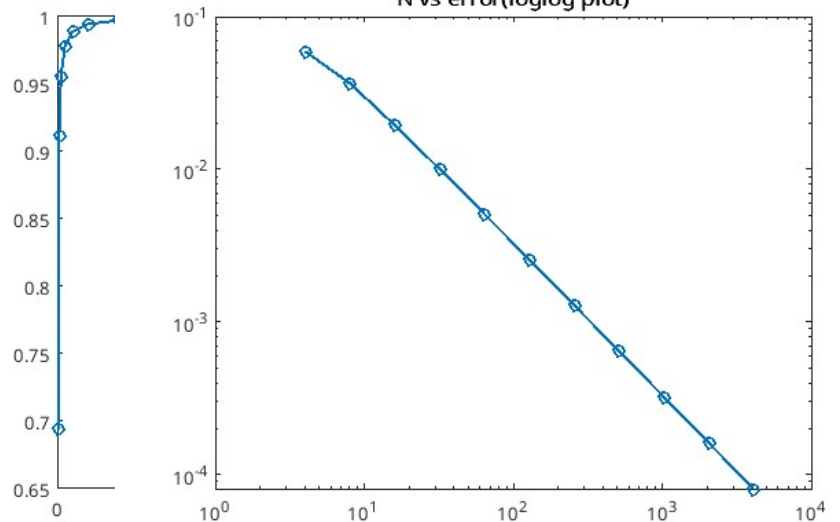
x vs Approximation and Actual Solution



x vs Error



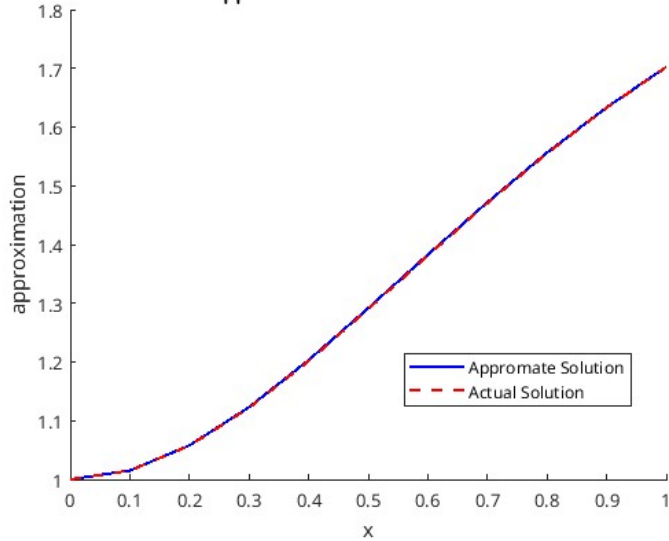
N vs error(loglog plot)



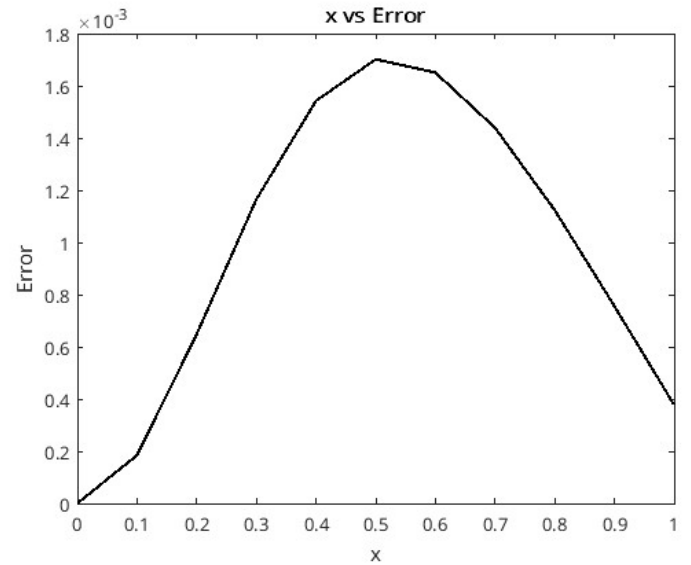
Runge Kutta 2nd Order

t	approximation	actual	error
0	1	1	0
0.1	1.015	1.01481549985822	0.0001845001417764
0.2	1.05782895089288	1.0571810074642	0.000647943428678577
0.3	1.12286281792299	1.12169801826798	0.00116479965500993
0.4	1.20302831702477	1.2014860103644	0.00154230666036415
0.5	1.29150646848125	1.28980527630561	0.00170119217564579
0.6	1.38258169760259	1.38093121544373	0.00165048215885255
0.7	1.4718540869499	1.47041518539722	0.00143890155267368
0.8	1.55615483380428	1.55503142343518	0.00112341036909891
0.9	1.63336880578335	1.63261318178287	0.000755624000484012
1	1.70224778342493	1.70187005276128	0.000377730663653653

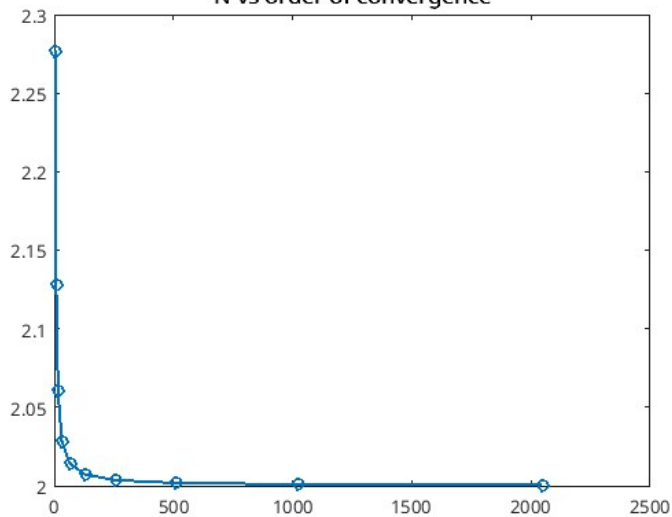
x vs Approximation and Actual Solution



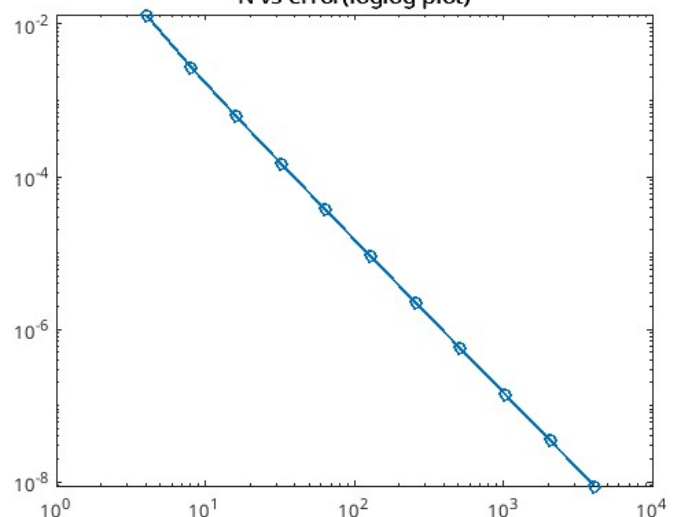
x vs Error



N vs order of convergence



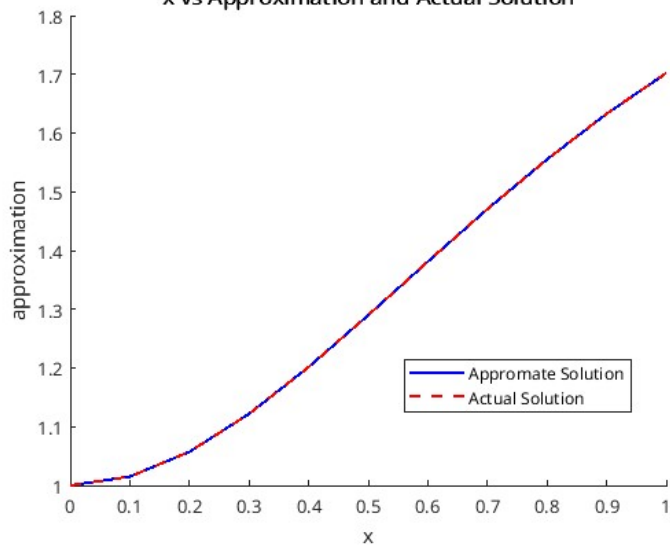
N vs error(loglog plot)



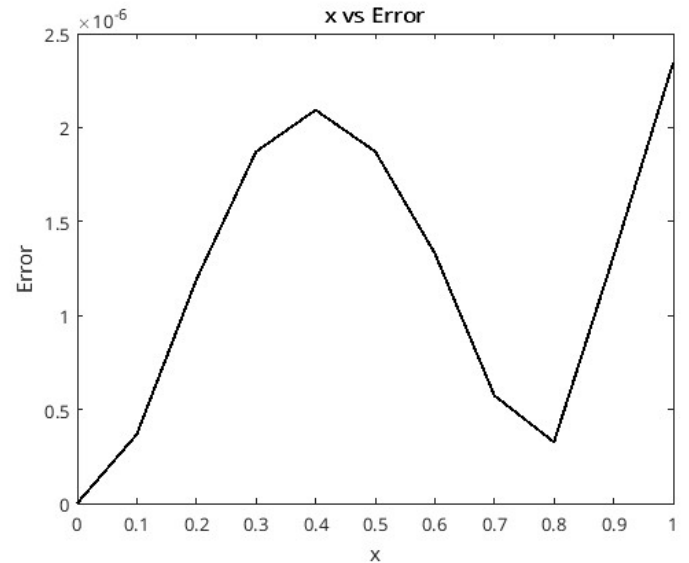
Runge Kutta 4th Order

t	approximation	actual	error
0	1	1	0
0.1	1.01481586700284	1.01481549985822	3.67144615154302e-07
0.2	1.05718219810417	1.0571810074642	1.19063996151247e-06
0.3	1.12169988971777	1.12169801826798	1.87144978847087e-06
0.4	1.20148810362448	1.2014860103644	2.09326007616362e-06
0.5	1.28980714875618	1.28980527630561	1.87245057259311e-06
0.6	1.38093254642537	1.38093121544373	1.33098163468404e-06
0.7	1.47041575933439	1.47041518539722	5.73937165126992e-07
0.8	1.55503109713822	1.55503142343518	3.26296961894457e-07
0.9	1.63261186640638	1.63261318178287	1.31537648861979e-06
1	1.70186770854212	1.70187005276128	2.3442191539047e-06

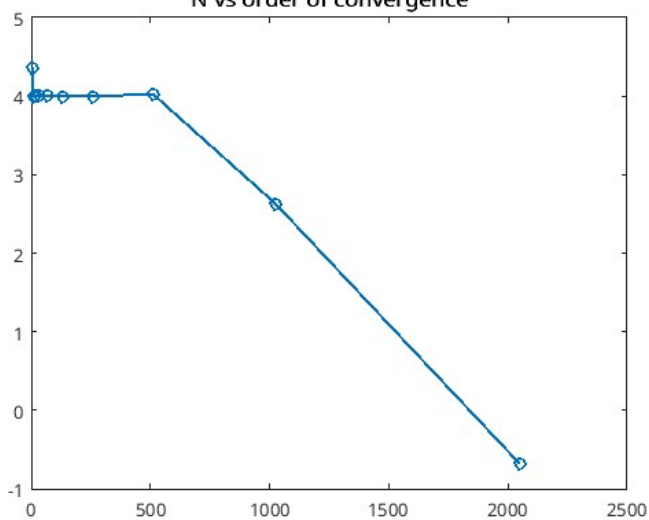
x vs Approximation and Actual Solution



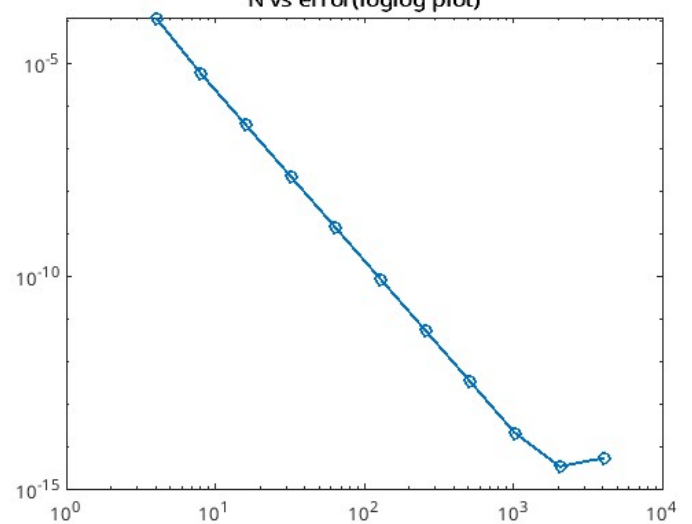
x vs Error



N vs order of convergence



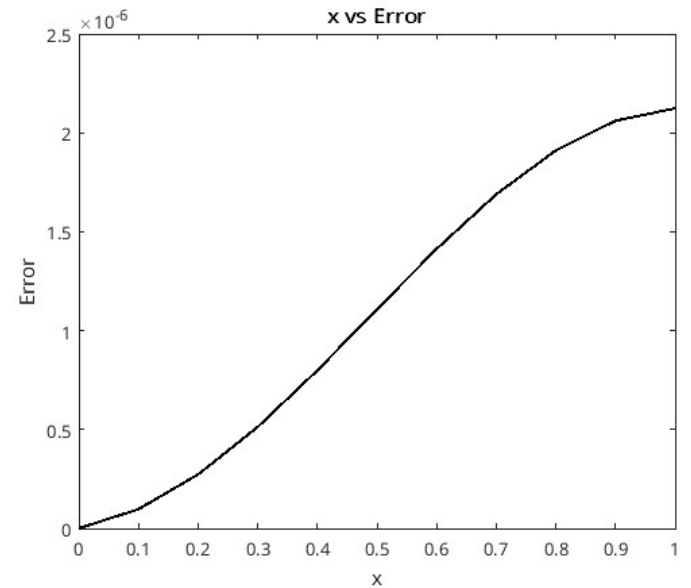
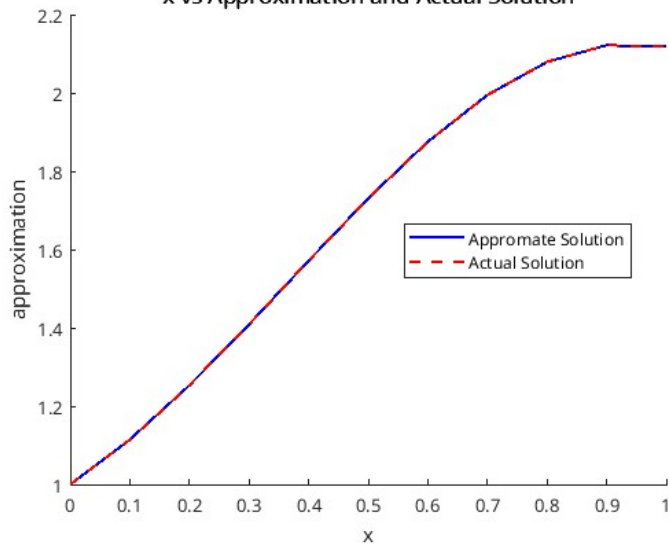
N vs error(loglog plot)



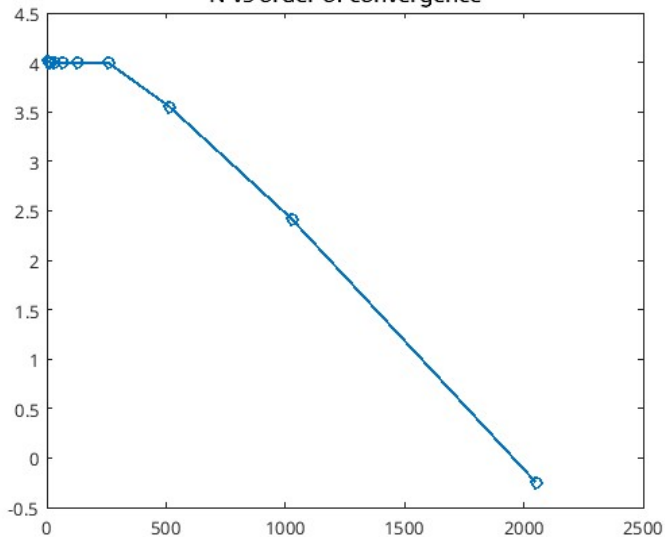
Q2)

t	approximation	actual	error
0	1	1	0
0.1	1.11422259959182	1.11422250235566	9.7236156237912e-08
0.2	1.25293090533928	1.2529306328511	2.72488182906372e-07
0.3	1.40845175999911	1.40845124727396	5.12725151002869e-07
0.4	1.57122625952187	1.5712254606242	7.98897670017951e-07
0.5	1.73049086605814	1.73048975851471	1.10754342430575e-06
0.6	1.87508832068056	1.87508690788131	1.41279924692483e-06
0.7	1.99434192183752	1.99434023319418	1.68864333693897e-06
0.8	2.07891995120454	2.0789180400345	1.91117004311181e-06
0.9	2.12161659014078	2.12161452944478	2.06069599562042e-06
1	2.11798166912361	2.11797954561299	2.12351061801286e-06

x vs Approximation and Actual Solution



N vs order of convergence



N vs error(loglog plot)

