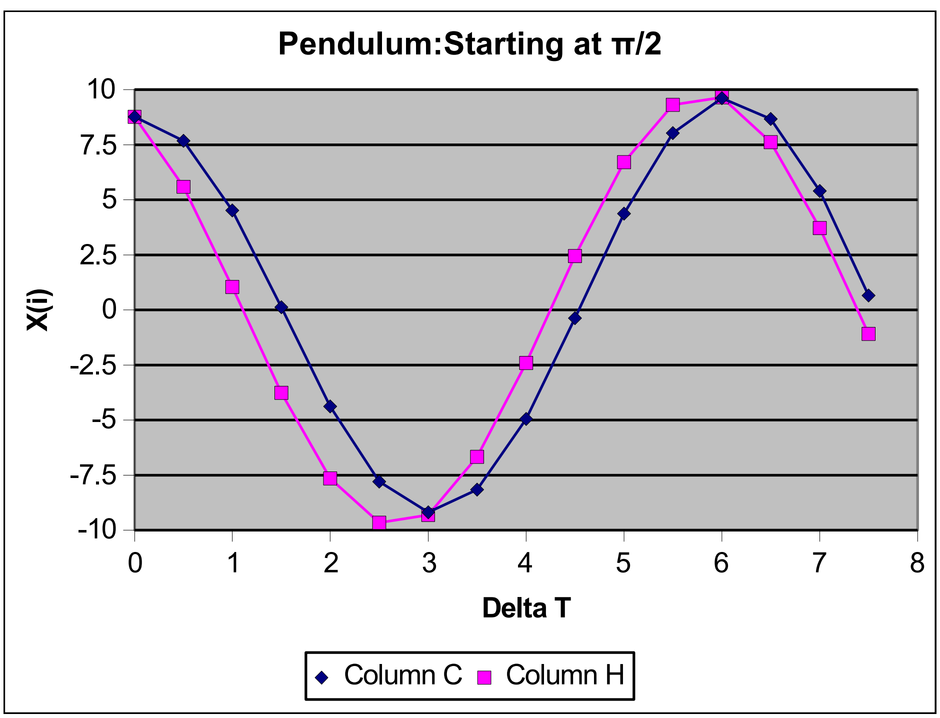
Michael Scanlon
ME 2080-Dynamics

Problem: For small θ, sin θ=θ and this reduces to θ=(1)θ=0 which is identical to the problem such considered. Use FM to determine θ and θ as functions of τ. Use your program to explore the cases where the weight is released from rest at θ0=0.1 rad. And π/2 radians.At what time t is θ=0? Is θ a maximum at this time? Compare your answers with the elementary solution where it is assumed the frequency of swing is f=(1/2π)sqrt(g/e)=(1/2π)*(cycles/sec)

Given information: small θ -->sin θ = θ

θ + (g/l)sinθ = 0 → θ + θ = 0 which is the same equation as x + x = 0

t	v(i)	x(i)	A(i)	v(i+1)	X(i+1)	A(i+1)	Analytical S	Delta
0	0	8.77	-8.77	-4.39	8.77	-8.77	8.77	0.5
0.5	-4.39	7.67	-7.67	-8.22	5.48	-5.48	5.59	
1	-7.67	4.52	-4.52	-9.93	0.69	-0.69	1.04	
1.5	-8.98	0.12	-0.12	-9.04	-4.37	4.37	-3.76	
2	-7.91	-4.38	4.38	-5.72	-8.34	8.34	-7.65	
2.5	-4.73	-7.79	7.79	-0.84	-10.16	10.16	-9.66	
3	-0.25	-9.18	9.18	4.35	-9.31	9.31	-9.3	
3.5	4.38	-8.16	8.16	8.46	-5.97	5.97	-6.67	
4	7.91	-4.95	4.95	10.39	-1	1	-2.41	
4.5	9.4	-0.38	0.38	9.58	4.32	-4.32	2.45	
5	8.41	4.37	-4.37	6.23	8.57	-8.57	6.7	
5.5	5.17	8.03	-8.03	1.16	10.61	-10.61	9.32	
6	0.51	9.61	-9.61	-4.29	9.87	-9.87	9.65	
6.5	-4.36	8.67	-8.67	-8.69	6.49	-6.49	7.62	
7	-8.14	5.41	-5.41	-10.85	1.33	-1.33	3.72	
7.5	-9.83	0.66	-0.66	-4.9	74.38	-74.38	-1.08	



θ is at 0 at t=1.6 and θ is at its maximum. This is due to the setup of the problem. When released from 90 degrees the pendulum reaches its fastest point at it's lowest point. This lowest point corresponds x(i)=0 and every π thereafter.