

2 STATE VARIABLE EQUATIONS

RK 2nd order																			
ti	Oi	vi	O'=O^2+2v+4D = f	f(Oi,vi,ti)	v'=O-2v = g	g(Oi,vi,ti)	ti+delt	ko	lo	Oi+1p	vi+1p	Di+1	f(Oi+1, vi+1g(Oi+1, vi+1	k1	l1	Oi+1c	vi+1C	Oi+1	vi+1
	0	2	0	0	4	2	0.2	0.8	0.4	2.8	0.4	-1.129284947	4.12286	2	0.824572	0.4	2.812286	0.4	2.812286
	0.2	2.812286	0.4	-1.129284947	4.191813	2.012286	0.4	0.838363	0.402457	3.650649	0.802457204	-1.864078172	7.475837	2.045734	1.495167	0.409147	3.979051	0.805802	3.979051
	0.4	3.979051	0.805802	-1.864078172	9.988138	2.367447	0.6	1.997628	0.473489	5.976679	1.279291412	-1.947695262	30.48849	3.418096	6.097698	0.683619	8.026714	1.384356	8.0267138
																			verC

verC

midpoint																	
ti	Oi	vi	O'=O^2-3v+2D = f	f(Oi,vi,ti)	v'=O-v^1.5 = g	g(Oi,vi,ti)	ti+delt/2	ko	lo	O+K0/2	V+lo/2	Di+1/2	f(O+ko/2, vg(Oi+ko/2,	k1	l1	O+k1=O+1v+1=V+1	verB
0	1	0.5	0.540302306	0.580605	0.6464466	0.05	0.05806	0.064645	1.02903	0.53232233	0.408487441	0.278911	0.640646	0.0277891	0.064065	1.027891	0.564065
0.1	1.027891	0.564065	0.267498829	-0.10064	0.6042548	0.15	-0.01006	0.060425	1.022859	0.594277299	0.120502769	-0.49559	0.564735	-0.04956	0.056473	0.978333	0.620538
0.2	0.978333	0.620538	-0.029199522	-0.96288	0.4895085	0.25	-0.09629	0.048951	0.930189	0.645013447	-0.178246056	-1.42628	0.412161	-0.14263	0.041216	0.835704	0.661754

0.251189 deltRK4 global

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mod Euler															
ti	Qi	vi	Q'=-Q^(2/3)+2v+P*f	Pi=sin3ti	f(ti,Qi,vi)	v'=-v^1.333+Q*g	g(ti,Qi,vi)	ti+delt	Qi+1p	vi+1p	Pi+1	f(ti+1, Qi+1, vi+1)	g(ti+1, Qi+1, vi+1)	Fi+1c	vi+1c
0	-2	0		0	1.587401		-2	0.1	-1.84126	-0.2	0.29552	1.397774299	-1.724299185	-1.85074	-0.18621
0.1	-1.85074	-0.18621		0.295520207	1.430497	-1.7444038		0.2	-1.70769	-0.36066	0.564642	1.272027089	-1.450973424	-1.71562	-0.34598
0.2	-1.71562	-0.34598		0.564642473	1.305786	-1.4727261		0.3	-1.58504	-0.49326	0.783327	1.156252335	-1.195306566	-1.59251	-0.47939

verA

euler global time step=mod euler global=(.1)^2=0.01

exam3 Fall 2017										RK 2nd order										and mod Euler calls									
ti	Oi	vi	O'=O+2vt-2D=f	f(Oi,vi,ti)	v'=4O-2v=g	g(Oi,vi,ti)	ti+delt	k1	l1	Oi+1p	vi+1p	Di+1	f(Oi+1, vi+1g(Oi+1, vi+1	k2	l2	Oi+1c	vi+1c	Oi+1	vi+1										
0	2	0	0	0	2	8	0.15	0.3	1.2	2.3	1.2	0.434965534	1.790069	6.8	0.26850	1.102	2.284255	1.111	2.2842552	1.111									
0.15	2.284255	1.11	0.434965534	1.747324	6.9170207	0.3	0.262099	1.037553	2.546354	2.147553102	0.78332691	2.268232	5.890309	0.340235	0.833546	2.583422	2.07053	2.5834219	2.07053										
0.3	2.585422	2.07055	0.78332691	2.261098	6.200588	0.45	0.339165	0.930088	2.924537	3.000637924	0.975723358	3.673714	5.69707	0.551057	0.854561	3.030533	2.962874	3.0305328	2.962874										

verC

verC

midpoint																
ti	Oi	vi	$O'=O*t-2v+D$	$f(Oi,vi,ti)$	$v'=O-v$	ti+delt/2	k1	l1	O+K1/2	V+1/2	Di+1/2	$f(O+k1/2, v_g(Oi+k1/2,$	k2	l2	$O+K2=O+1v+1=V+1$	verB
0	1	0.5	0.540302306	-0.4597	0.5	0.1	-0.09194	0.1	0.95403	0.55	0.267498829	-0.7371 0.40403	-0.14742	0.080806	0.85253 0.580806	
0.2	0.85258	0.580806	-0.029199522	-1.0203	0.2717743	0.3	-0.20406	0.054355	0.750551	0.607983479	-0.323289567	-1.31409 0.142567	-0.26282	0.028513	0.589762 0.60932	
0.4	0.589762	0.60932	-0.588501117	-1.57124	-0.0195574	0.5	-0.31425	-0.00391	0.432639	0.607363774	-0.801143616	-1.79955 -0.17473	-0.35991	-0.03495	0.229352 0.574374	

mod Euler															
ti	Qi	vi	Q'=-Q+2v+P = f	Pi=sin3ti	f(ti,Qi,vi)	v'=-3v+Q*t = g	g(ti,Qi,vi)	ti+delt	Qi+1p	vi+1p	Pi+1	f(ti+1, Qi+1, vi+1)	g(ti+1, Qi+1, vi+1)	Fi+1c	vi+1c
0	-3	0		0	3	0		0.1	-2.7	0	0.29552	2.995520207	-0.27	-2.70022	-0.0135
0.1	-2.70022	-0.0135		0.295520207	2.968744	-0.2295224		0.2	-2.40335	-0.03645	0.564642	2.895087564	-0.371313194	-2.40703	-0.04354
0.2	-2.40703	-0.04354		0.564642473	2.884591	-0.3507811		0.3	-2.11857	-0.07862	0.783327	2.744660392	-0.3997123	-2.12557	-0.08107

mod Euler																	
ti	Qi	vi	Q'=-Q+2*v+P = f	Pi=sin3ti	f(ti,Qi,vi)	g(ti,Qi,vi)	v'=-3v+Q*t^2 = g	t +delt	Qi+1p	vi+1p	Pi+1	f(t +1, Qi+1, vi+1)	g(ti+1, Qi+1, vi+1)	Fi+1c	vi+1c	verA (makeup)	O(dt^2me)=O(dte)=0.01
0	-3	0		0	0	3	0	0.1	-2.7	0	0.29552	2.995520207	-0.027	-2.70022	-0.00135		
0.1	-2.70022	-0.00135	0.295520207	2.993044	-0.0229522			0.2	-2.40092	-0.00365	0.564642	2.958271595	-0.085101111	-2.40266	-0.00675		
0.2	-2.40266	-0.00675	0.564642473	2.953795	-0.0758483			0.3	-2.10728	-0.01434	0.783327	2.861930576	-0.14664258	-2.11187	-0.01788		