Homework 2 report

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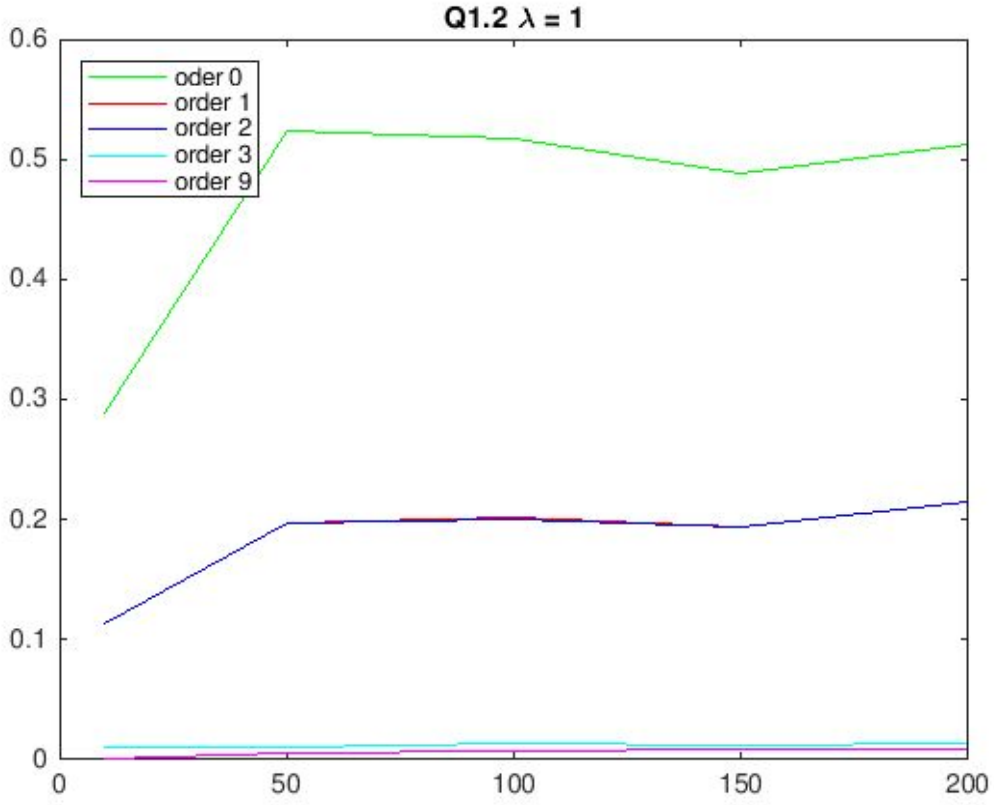
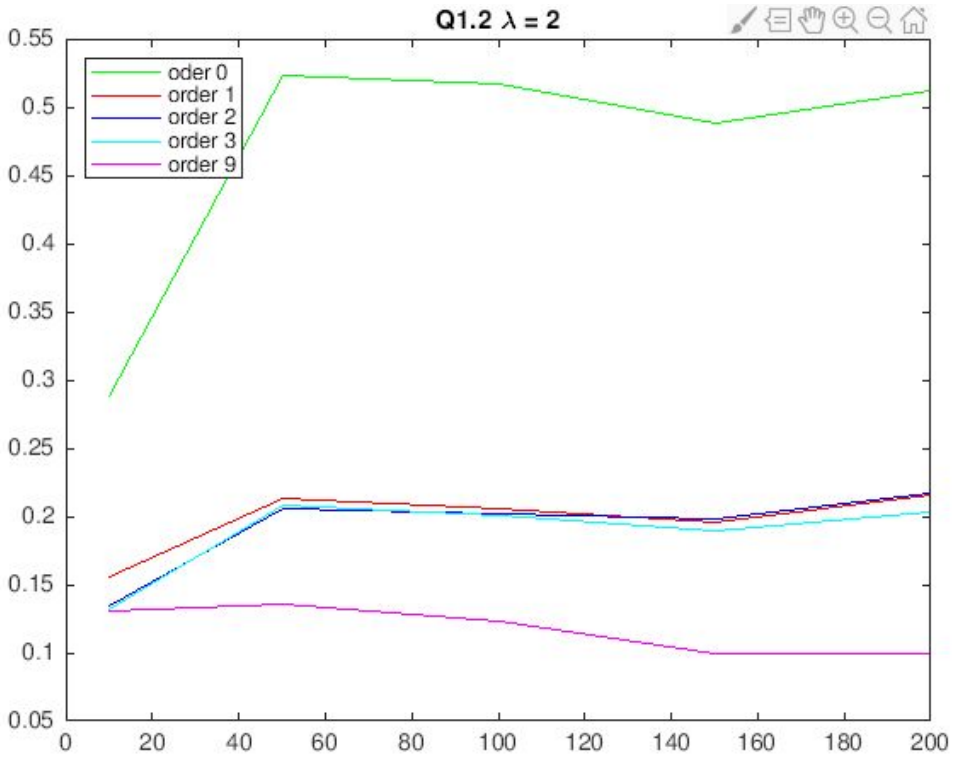
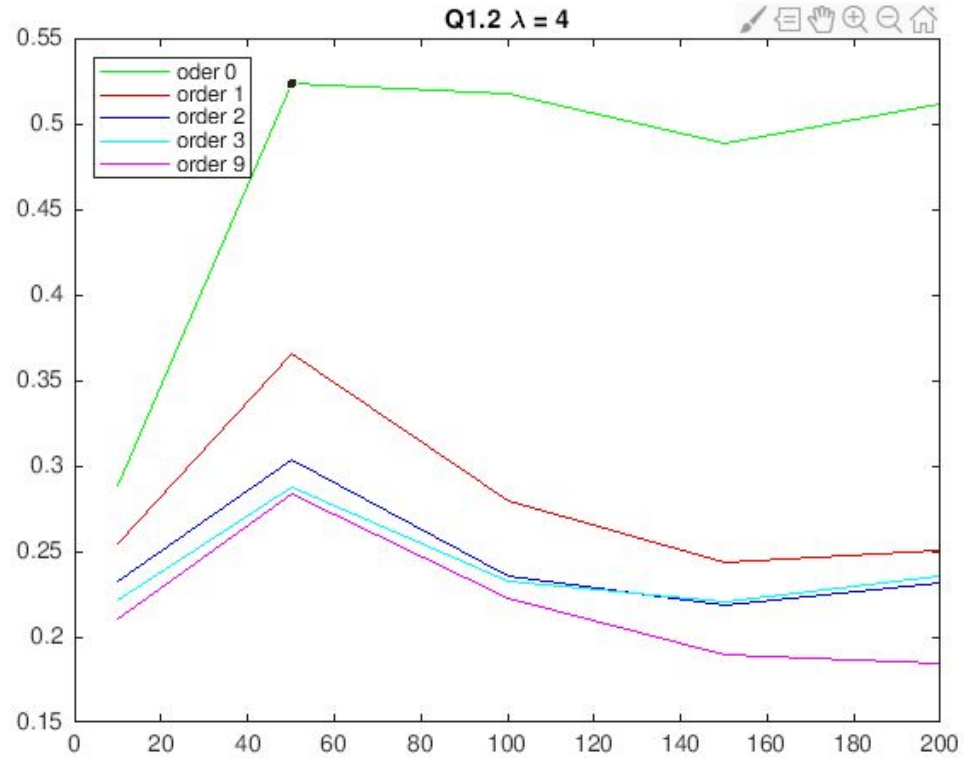
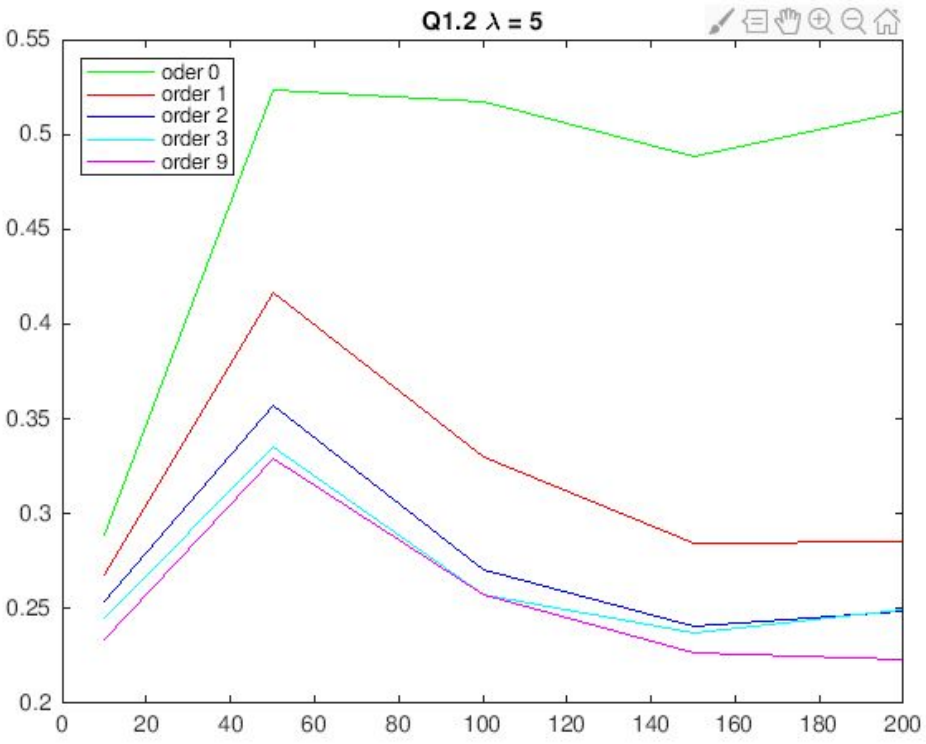
Question 1

1.2




Q1.2 λ = 2
oder 0
order 1
order 2
order 3
order 9
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
20
40
60
80
100
120
140
160
180
200


Q1.2 λ = 4
oder 0
order 1
order 2
order 3
order 9
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0
20
40
60
80
100
120
140
160
180
200


Q1.2 λ = 5
oder 0
order 1
order 2
order 3
order 9
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0
20
40
60
80
100
120
140
160
180
200

Table

size = 10										
lambda = 0						lambda = 1				
order	0	1	2	3	9	0	1	2	3	9
w0	0.405785	1.246249	0.229073	-0.420984	-9.923421	0.405785	0.696632	0.743173	0.751483	0.75339
w1		-2.64222	5.048202	14.653563	438.701685		-0.914354	-0.701733	-0.612368	-0.53277
w2			-9.273699	-42.650523	-6790.589765			-0.740907	-0.657084	-0.57946
w3				29.472624	49764.35682				-0.534475	-0.47204
w4					-167735.5758					-0.355978
w5					98952.40357					-0.262032
w6					1008926.51					-0.191378
w7					-3079977.082					-0.139448
w8					3537770.449					-0.101561
w9					-1472034.582					-0.07398
lambda = 4						lambda = 9				
order	0	1	2	3	9	0	1	2	3	9
w0	0.405785	0.503983	0.537979	0.551052	0.562277	0.405785	0.452458	0.471343	0.479461	0.48709
w1		-0.308712	-0.281993	-0.268272	-0.254121		-0.14673	-0.140493	-0.137088	-0.133406
w2			-0.275761	-0.263342	-0.250227			-0.135425	-0.132364	-0.128983
w3				-0.208302	-0.198012				-0.104116	-0.101476
w4					-0.148049					-0.075735
w5					-0.108789					-0.055628
w6					-0.079511					-0.040661
w7					-0.058027					-0.029683
w8					-0.042342					-0.021667
w9					-0.030905					-0.015821
lambda = 16										
order	0	1	2	3	9					
w0	0.405785	0.432692	0.444215	0.449372	0.454377					
w1		-0.084591	-0.08249	-0.081315	-0.080019					
w2			-0.079114	-0.07806	-0.076874					
w3				-0.061279	-0.060354					
w4					-0.045015					
w5					-0.033059					
w6					-0.024165					
w7					-0.017642					
w8					-0.01288					
w9					-0.009406					

size = 50										
lambda = 0						lambda = 1				
order	0	1	2	3	9	0	1	2	3	9
w0	-0.042483	1.119059	0.977345	-0.139775	0.112248	-0.042483	0.871287	0.808171	0.783288	0.816629
w1		-2.312394	-1.485571	11.343192	-8.108536		-1.819129	-1.04629	-0.945321	-0.918892
w2			-0.839095	-33.424618	298.116539			-0.996978	-0.826292	-0.964311
w3				22.406193	-2552.916546				-0.344616	-0.608917
w4					11063.35472					-0.265022
w5					-28198.85296					-0.007402
w6					43474.36716					0.170167
w7					-39689.07894					0.287433
w8					19722.34534					0.362156
w9					-4109.548135					0.407635
lambda = 4						lambda = 9				
order	0	1	2	3	9	0	1	2	3	9
w0	-0.042483	0.514714	0.581106	0.581473	0.577662	-0.042483	0.295136	0.390328	0.415606	0.423178
w1		-1.109265	-0.755212	-0.640108	-0.597595		-0.672131	-0.522498	-0.455971	-0.403299
w2			-0.749019	-0.608731	-0.554384			-0.522436	-0.446412	-0.380358
w3				-0.439502	-0.384261				-0.353049	-0.285365
w4					-0.231288					-0.198578
w5					-0.116035					-0.131586
w6					-0.033572					-0.082117
w7					0.024336					-0.046007
w8					0.064639					-0.019667
w9					0.092478					-0.000403
lambda = 16										
order	0	1	2	3	9					
w0	-0.042483	0.175097	0.260628	0.292802	0.315074					
w1		-0.433157	-0.365504	-0.329874	-0.29077					
w2			-0.366521	-0.326727	-0.279467					
w3				-0.266621	-0.219156					
w4					-0.16277					
w5					-0.118336					
w6					-0.084782					
w7					-0.059672					
w8					-0.040843					
w9					-0.02664					

size = 100

lambda = 0					
order	0	1	2	3	9
w0	-0.001523	0.820081	0.87165	-0.183216	-0.025494
w1		-1.634013	-1.964415	11.816125	3.778486
w2			0.329446	-34.407868	68.887736
w3				22.979251	-583.447907
w4					2044.980548
w5					-4253.690018
w6					5432.234499
w7					-4051.669574
w8					1577.088112
w9					-238.128399

lambda = 1					
0	1	2	3	9	
-0.001523	0.741775	0.687567	0.71256	0.74909	
	-1.478276	-1.024841	-1.092252	-0.729642	
		-0.499753	-0.749882	-1.196809	
			0.355059	-0.795816	
				-0.314797	
				0.065329	
				0.333343	
				0.512738	
				0.628246	
				0.699184	

lambda = 4					
order	0	1	2	3	9
w0	-0.001523	0.576502	0.572358	0.564473	0.609423
w1		-1.14958	-0.733655	-0.685616	-0.711064
w2			-0.589484	-0.515683	-0.68423
w3				-0.155281	-0.425654
w4					-0.182815
w5					0.002635
w6					0.136054
w7					0.229949
w8					0.295277
w9					0.340223

lambda = 9					
0	1	2	3	9	
-0.001523	0.420213	0.466024	0.466299	0.479183	
	-0.838751	-0.573453	-0.503888	-0.515055	
		-0.515342	-0.4256	-0.459787	
			-0.246107	-0.296311	
				-0.151043	
				-0.041115	
				0.038484	
				0.095369	
				0.135851	
				0.164569	

lambda = 16					
order	0	1	2	3	9
w0	-0.001523	0.304406	0.371943	0.384859	0.389239
w1		-0.608435	-0.45078	-0.393478	-0.378699
w2			-0.422173	-0.352793	-0.33646
w3				-0.243864	-0.228511
w4					-0.133692
w5					-0.061759
w6					-0.009216
w7					0.028825
w8					0.056365
w9					0.076332

size = 150

lambda = 0					
order	0	1	2	3	9
w0	-0.001742	0.940717	0.956018	-0.232067	-0.067055
w1		-1.886308	-1.977735	12.197797	5.705244
w2			0.091277	-35.267425	40.498251
w3				23.530971	-442.863196
w4					1827.024418
w5					-4621.033805
w6					7292.56893
w7					-6845.666844
w8					3484.811225
w9					-740.954893

lambda = 1					
0	1	2	3	9	
-0.001742	0.870797	0.791852	0.826604	0.827077	
	-1.746364	-1.185381	-1.252509	-0.657316	
		-0.604942	-0.985701	-1.466695	
			0.502818	-1.026121	
				-0.416753	
				0.075597	
				0.420093	
				0.644468	
				0.781941	
				0.859335	

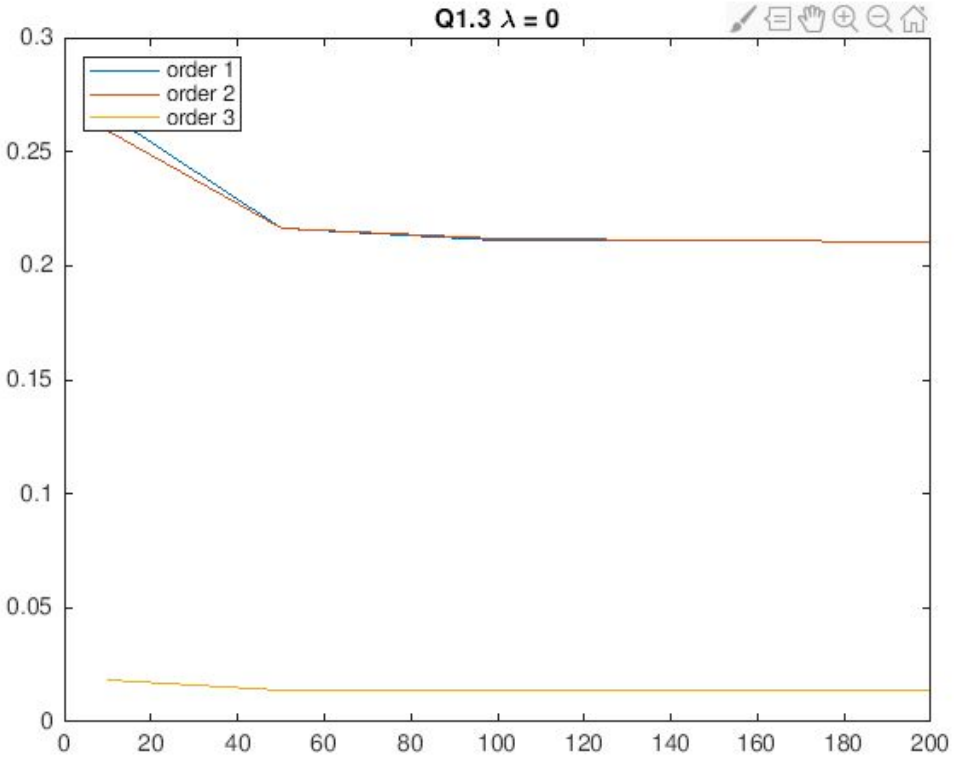
lambda = 4					
order	0	1	2	3	9
w0	-0.001742	0.711951	0.67886	0.668968	0.726484
w1		-1.428438	-0.884582	-0.841441	-0.829961
w2			-0.717005	-0.643737	-0.871889
w3				-0.144408	-0.554941
w4					-0.234374
w5					0.015298
w6					0.19486
w7					0.319651
w8					0.40451
w9					0.460935

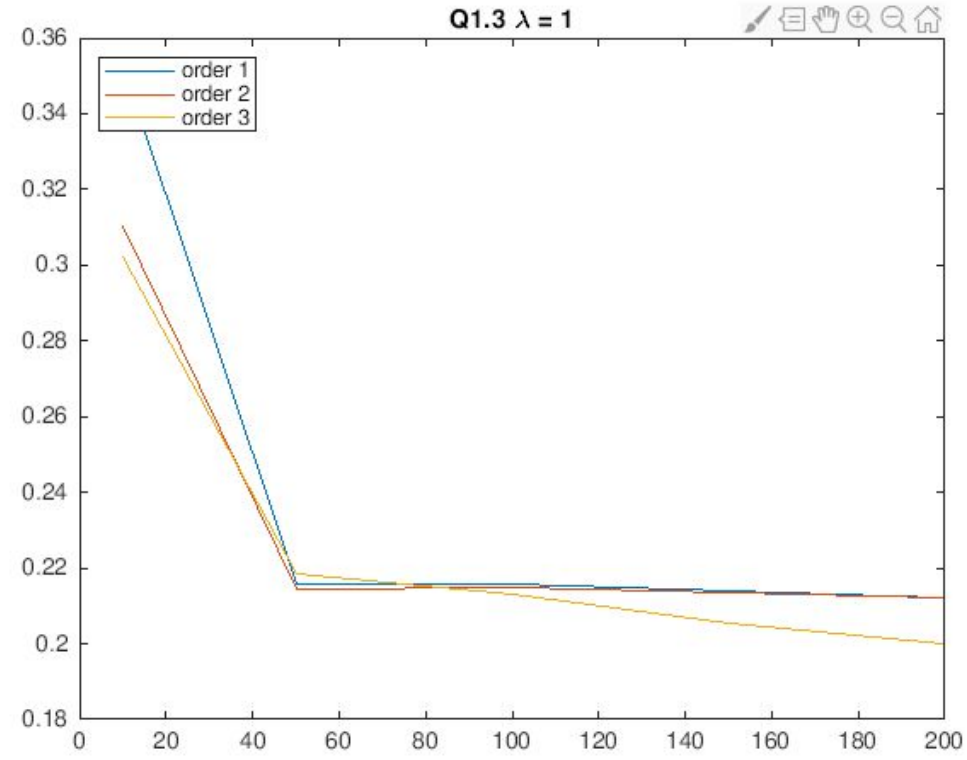
lambda = 9					
0	1	2	3	9	
-0.001742	0.545814	0.573157	0.564892	0.589427	
	-1.095919	-0.717678	-0.634326	-0.652872	
		-0.649964	-0.53729	-0.607746	
			-0.283954	-0.391251	
				-0.189667	
				-0.035189	
				0.076381	
				0.155121	
				0.210001	
				0.247805	

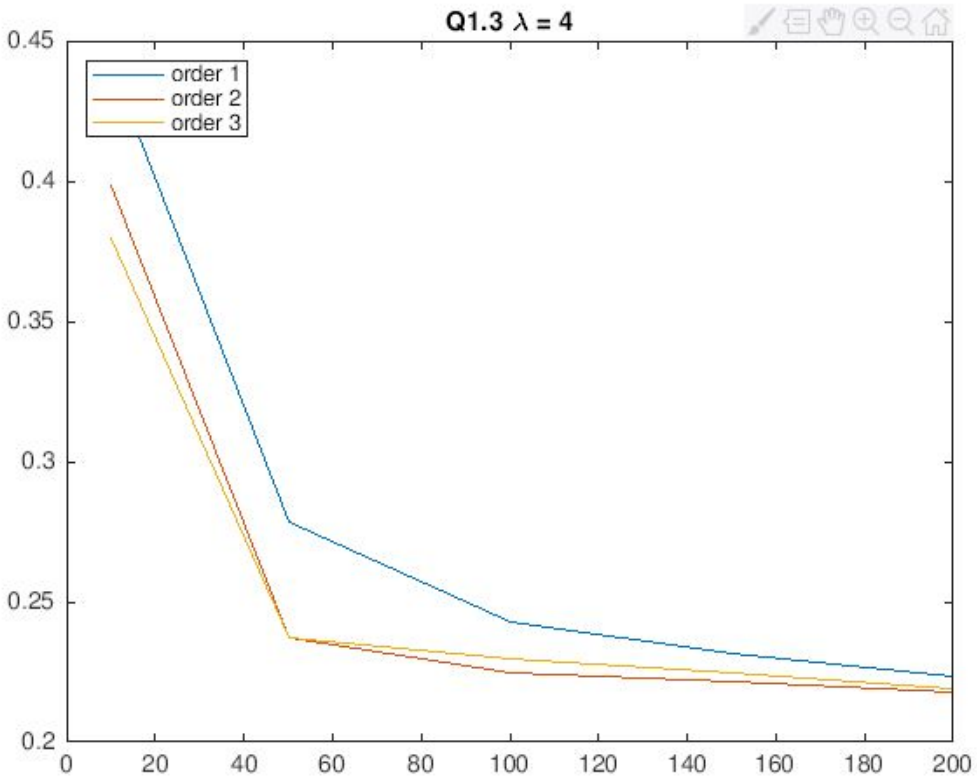
lambda = 16					
order	0	1	2	3	9
w0	-0.001742	0.411227	0.473868	0.478631	0.485276
w1		-0.826547	-0.58439	-0.507572	-0.499795
w2			-0.551733	-0.456199	-0.454583
w3				-0.300214	-0.304869
w4					-0.168694
w5					-0.064504
w6					0.011263
w7					0.065397
w8					0.10379
w9					0.130866

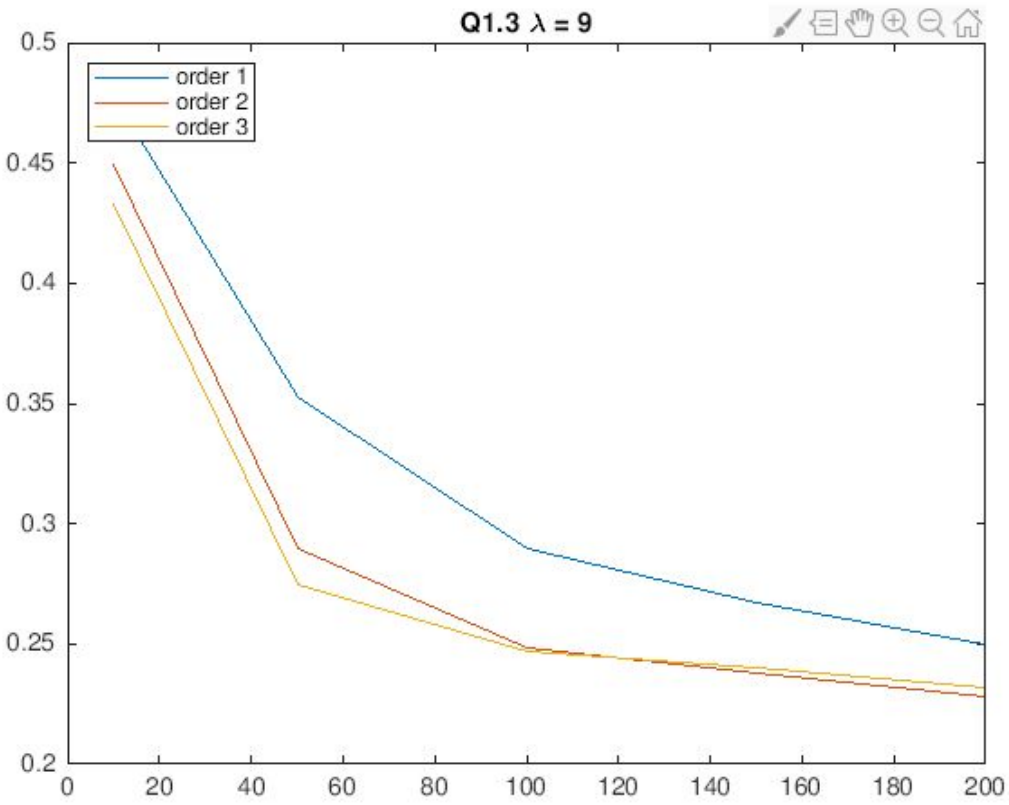
size = 200										
lambda = 0						lambda = 1				
order	0	1	2	3	9	0	1	2	3	9
w0	-0.008548	0.921843	0.940458	-0.193332	-0.014297	-0.008548	0.869674	0.796725	0.840267	0.805992
w1		-1.860782	-1.973036	11.805403	4.131673		-1.756444	-1.256719	-1.306393	-0.504813
w2			0.112254	-34.420319	51.692324			-0.52941	-1.131113	-1.627055
w3				23.021715	-446.472404				0.725818	-1.152951
w4					1532.572148					-0.462807
w5					-3132.563548					0.091426
w6					3893.677565					0.471933
w7					-2737.552522					0.712113
w8					936.068902					0.851863
w9					-101.467109					0.92322
lambda = 4						lambda = 9				
order	0	1	2	3	9	0	1	2	3	9
w0	-0.008548	0.743215	0.694073	0.690854	0.752605	-0.008548	0.597718	0.603353	0.592143	0.630222
w1		-1.503526	-0.934925	-0.922695	-0.85197		-1.212531	-0.773221	-0.699603	-0.72348
w2			-0.703708	-0.679854	-0.972778			-0.674177	-0.568008	-0.692439
w3				-0.043249	-0.624346				-0.243089	-0.439785
w4					-0.257437					-0.200476
w5					0.031044					-0.016175
w6					0.239019					0.117196
w7					0.383479					0.211393
w8					0.481495					0.277056
w9					0.546445					0.322283
lambda = 16										
order	0	1	2	3	9					
w0	-0.008548	0.468466	0.514959	0.512683	0.527077					
w1		-0.954028	-0.647718	-0.566364	-0.574083					
w2			-0.597442	-0.492446	-0.524861					
w3				-0.29248	-0.342977					
w4					-0.176772					
w5					-0.04951					
w6					0.043011					
w7					0.109063					
w8					0.155845					
w9					0.188775					

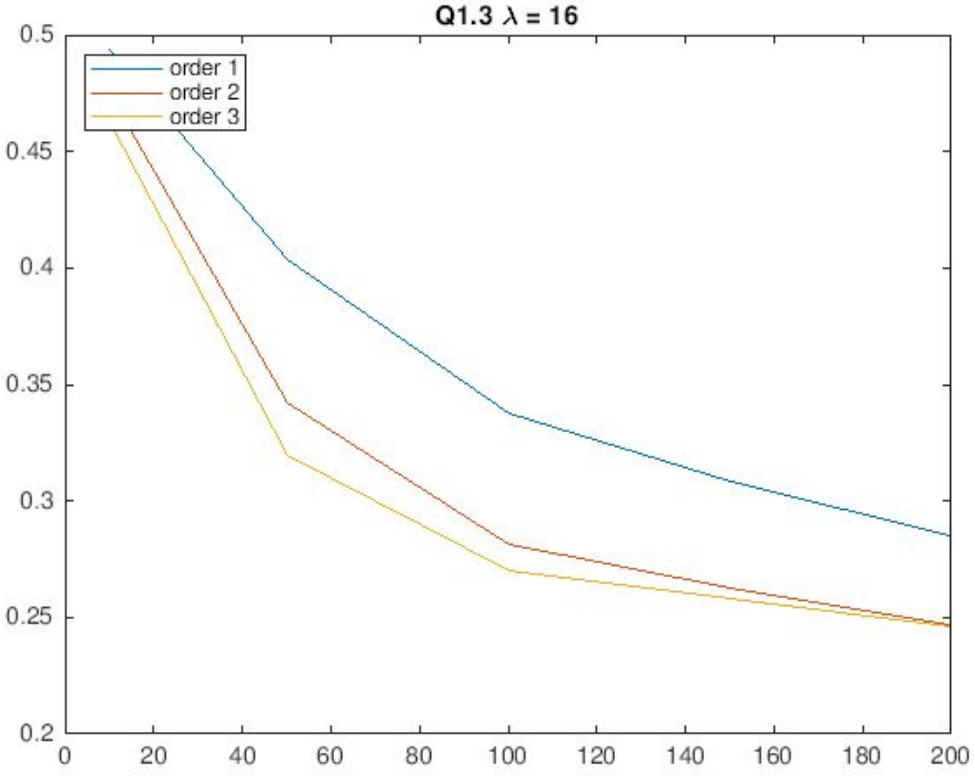
Q 1.3


Q1.3 λ = 0
order 1
order 2
order 3
0.3
0.25
0.2
0.15
0.1
0.05
0
0
20
40
60
80
100
120
140
160
180
200


Q1.3 λ = 1
order 1
order 2
order 3
0.36
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0
20
40
60
80
100
120
140
160
180
200


Q1.3 λ = 4
order 1
order 2
order 3
0.45
0.4
0.35
0.3
0.25
0.2
0
20
40
60
80
100
120
140
160
180
200


Q1.3 λ = 9
order 1
order 2
order 3
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0
20
40
60
80
100
120
140
160
180
200

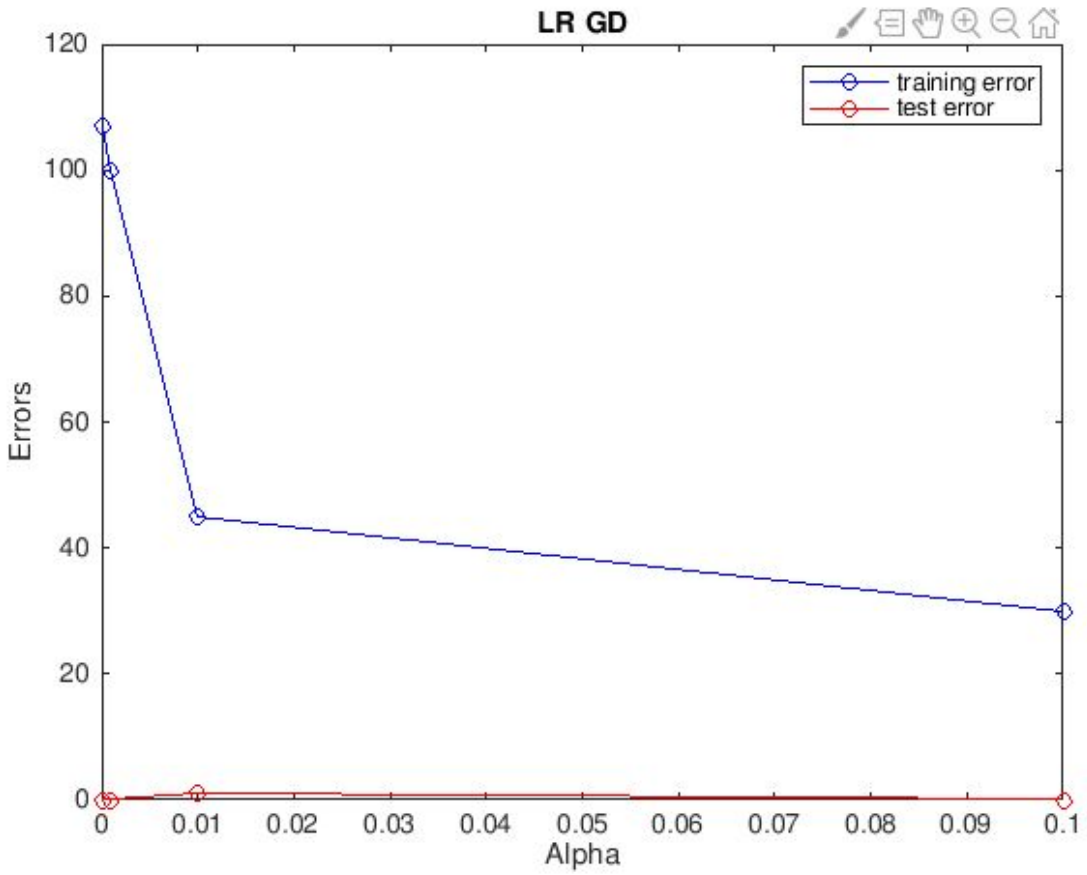

Q1.3 λ = 16
order 1
order 2
order 3
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0
20
40
60
80
100
120
140
160
180
200

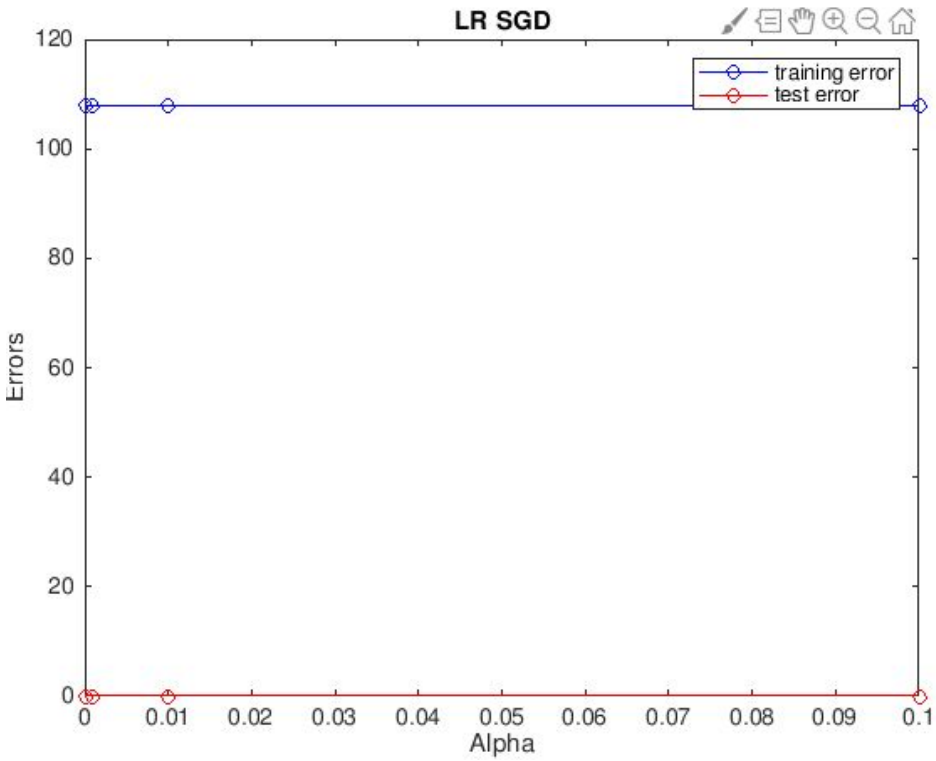
Q1.4

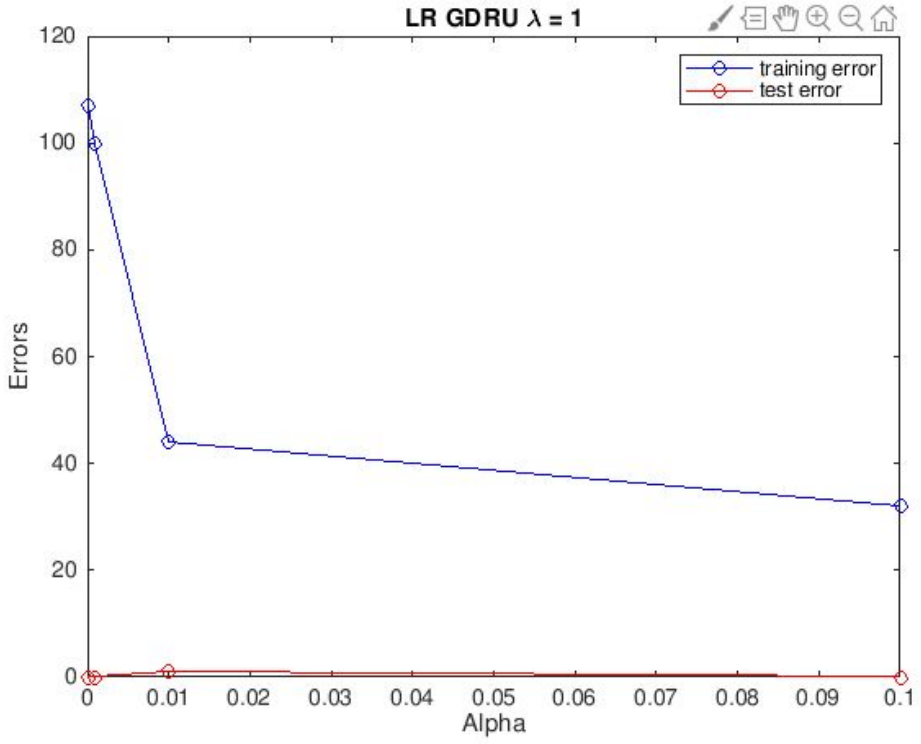
I analyze order equal to 1,2,3.
size bigger perform better , Lambda = 0, order = 3, perform best because model fitting well

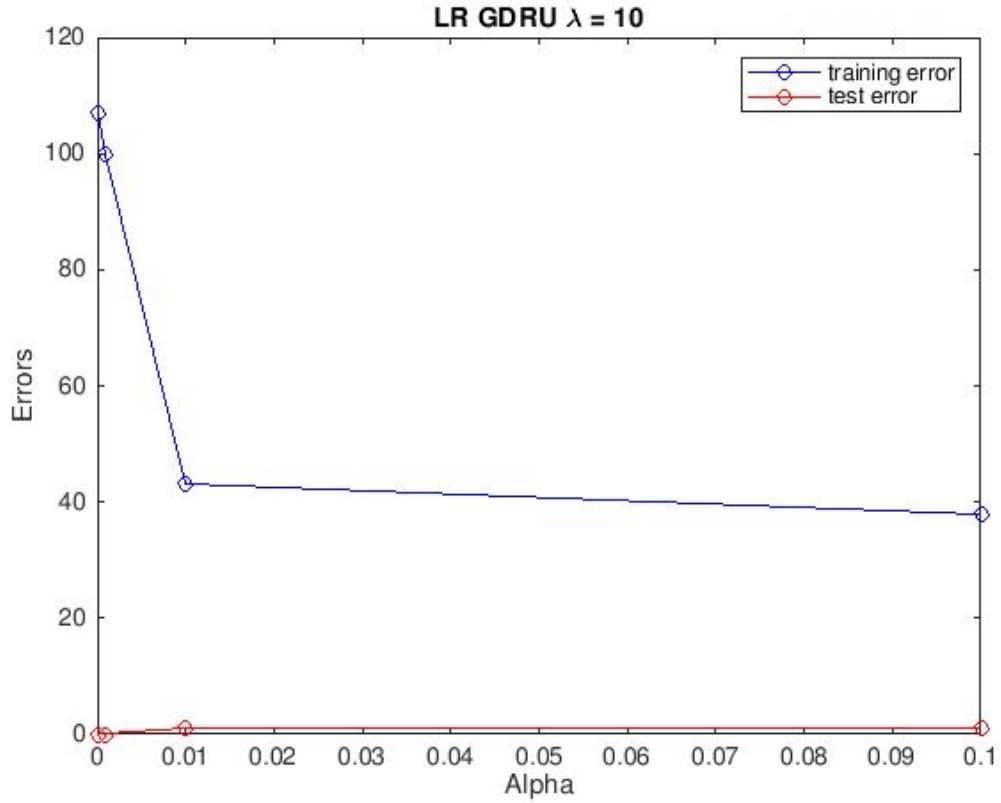
Order = 1 ,perform worse , because model less fitting

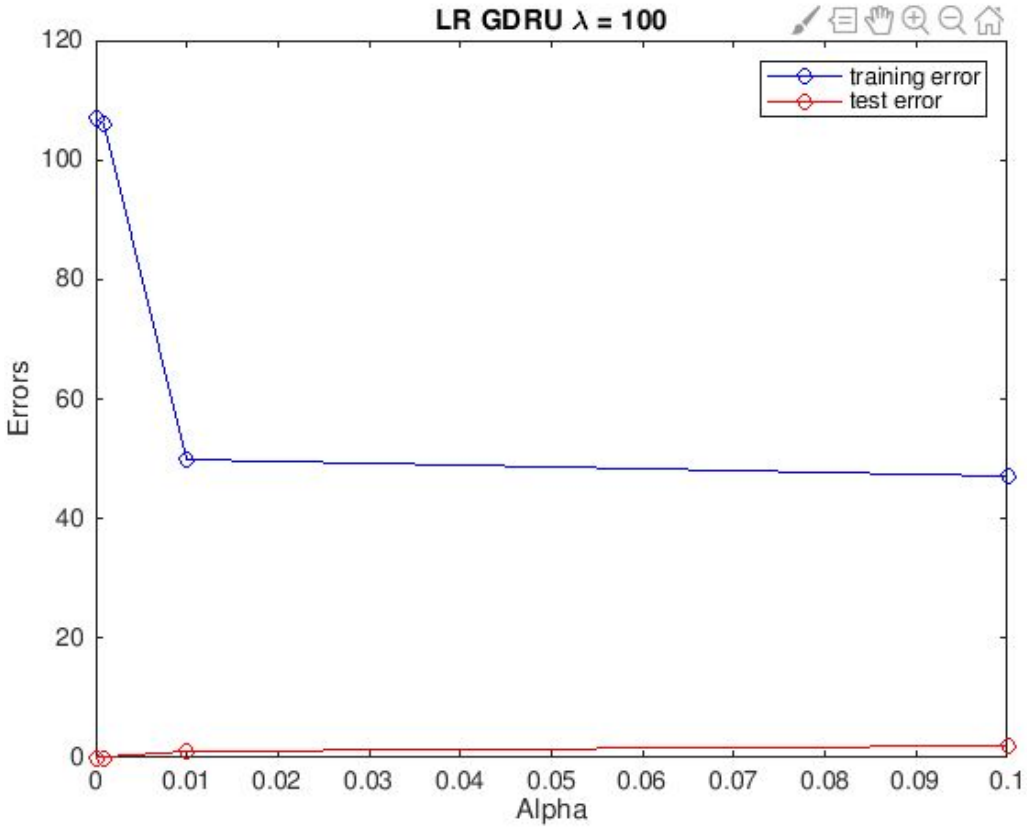
Q 2




LR SGD
training error
test error
Errors
Alpha
0
20
40
60
80
100
120
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1


LR GDRU λ = 1
training error
test error
Errors
Alpha
0
20
40
60
80
100
120
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1


LR GDRU λ = 10
training error
test error
Errors
Alpha
0
20
40
60
80
100
120
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1


LR GDRU λ = 100
training error
test error
Errors
Alpha
0
20
40
60
80
100
120
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1

Lambda = 1 is the best , lambda is small, perform better