

Numerical Results for a Projected-Search Interior Method*

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Abstract

This document detailed numerical results for the article “A Projected-Search Interior Method for Nonlinear Optimization” [2] .

1. Introduction

The results were obtained for problems from the CUTEst test collection (see Bongartz et al. [1] and Gould, Orban and Toint [3]). The runs were done using MATLAB version R2020a on an iMac with a 3.0 GHz Intel Zeon W processor and 128 GB of 800 MHz DDR4 RAM running macOS, version 10.14.6 (64 bit). Results were obtained for five subsets of problems from the CUTEst test collection. The subsets consisted of 135 problems with a general nonlinear objective and upper and lower bounds on the variables (problems BC); 212 problems with a general nonlinear objective, general linear constraints and bounds on the variables (problems LC); 124 problems formulated by Hock and Schittkowski ([4]) (problems HS); 372 problems with a general nonlinear objective, general linear and nonlinear constraints and bounds on the variables (problems NC); and 117 problems with a quadratic objective, general linear constraints and bounds on the variables (problems QP). The BC, LC, NC and QP subsets were selected based on the number of variables and general constraints. In particular, a problem was chosen if the associated KKT system was of the order of 1000 or less. The same criterion was used to set the dimension of those problems for which the problem size can be specified. The nonsmooth problem `hs87` was excluded from the Hock-Schittkowski problems. Exact second derivatives were used for all the runs.

For each problem, the tables list the following: the number of variables “`n`”; the number of general constraints “`m`”; the number of iterations taken “`Itn`”; the number of function evaluations required “`Fe`”; and the final objective value “`Objective`”. The last column provides details of any non-optimal exits. An empty entry in the “`Exit`” column indicates an optimal exit. The letters “`i`” and “`u`” mark the problems judged to be infeasible or unbounded, respectively; “`sty`” indicates an infeasible stationary point; “`ls`” means that the line search could not find a sufficiently better point; “`a`” means that the merit function was increasing along the computed direction; and “`undef`” indicates that the problem functions were undefined at the initial point.

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Table 1: Control parameters for Algorithms **pdb**, **pdbAll** and **pdProj**.

Parameter	Description	Value
$s_{\max}, y_{\max}, w_{\max}$	Maximum allowed y^E, w^E, s^E	1.0e+6
μ_0^P	Initial penalty parameter	1.0e-4
μ_0^L	Initial flexible line-search penalty parameter	1.0
μ_0^B	Initial barrier parameter	1.0e-4
τ_0	Initial termination tolerance for specifying an M-iterate	0.5
τ_P	Primal feasibility tolerance	1.0e-4
τ_D	Dual feasibility tolerance	1.0e-4
τ_{inf}	Infeasible stationary point tolerance	1.0e-4
χ_0^{\max}	Initial target for an O-iteration	1.0e+3
η_A	Line-search Armijo sufficient reduction	1.0e-2
η_F	Line-search sufficient reduction for $\ F\ $	1.0e-2
γ_A	Line-search factor for reducing an Armijo step	1.0e-3
f_{unb}	Unbounded objective	1.0e-9
M_{\max}	Constant in the line-search tolerance	1.0e+12
F_{\max}	Constant in the line-search tolerance	1.0e+8
σ	Bound perturbation in the definition of Ω_k	0.8
k_{\max}	Iteration limit	500

Table 2: Results on small CUTEst bound-constrained (BC) problems

Name	n	pdb				pdproj			
		fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
3PK	30	17	17	1.7201620e+00		13	13	1.7201650e+00	
AIRCRAFT	8	16	12	1.1709525e-14		16	12	1.1709525e-14	
ALLINIT	4	11	11	1.6705968e+01		8	8	1.6705968e+01	
BDEXP	500	13	13	3.2866900e-03		9	9	2.9719656e-03	
BIGGS3	6	9	7	2.3390554e-09		9	7	2.3390554e-09	
BIGGS5	6	31	20	6.4161833e-10		31	20	6.4161833e-10	
BIGGSB1	25	10	10	1.5993615e-02		6	6	1.5028330e-02	
BLEACHNG	17	10	10	9.1791952e+03		2	2	9.1759109e+03	
BOX2	3	5	5	8.4267573e-12		5	5	8.4267573e-12	
BQP1VAR	1	7	7	8.4259105e-05		2	2	0.0000000e+00	
BQPGABIM	50	14	14	9.7534942e-05		9	9	-1.6640987e-06	
BQPGASIM	50	14	14	1.2778112e-04		9	9	-5.0795567e-06	
BRATU1D	503	3	3	-8.5166387e+00		3	3	-8.5166387e+00	
CAMEL6	2	11	11	-1.0316285e+00		11	10	-2.1546383e-01	
CHARDISO	400	16	16	5.4013753e-13		5	5	1.2598913e-20	
CHEBYQAD	100	0	0	4.9546152e+01		0	0	4.9546152e+01	
CHENHARK	100	10	10	-1.9985569e+00		6	6	-1.9997829e+00	
CLPLATEA	529	5	5	-1.0973870e-02		5	5	-1.0973870e-02	
CLPLATEB	529	2	2	-5.4274570e-03		2	2	-5.4274570e-03	
CLPLATEC	529	1	1	-5.0590060e-03		1	1	-5.0590060e-03	
CVXBQP1	100	9	9	2.2872128e+02		6	6	2.2830315e+02	
DECONVB	63	36	36	2.5716281e-03		27	23	2.7136678e-03	
DEGDIAG	1001	7	7	1.6678312e+02		6	6	1.6666541e+02	
DEGTRID	1001	11	11	-9.9949998e+02		8	8	-9.9949996e+02	
DEGTRID2	1001	8	8	-9.9948431e+02		8	8	-9.9948412e+02	
DRCV1LQ	196	42	32	7.1154044e-12		42	32	7.1154044e-12	
DRCV2LQ	196	22	19	9.6618218e-03		22	19	9.6618218e-03	
DRCV3LQ	196	19	19	5.3603001e-10		19	19	5.3603001e-10	
EG1	3	8	8	-1.4292909e+00		6	6	-1.4293068e+00	
EXPLIN	120	11	11	-7.2339840e+05		14	11	-7.2375626e+05	
EXPLIN2	120	11	11	-7.2407659e+05		14	11	-7.2445914e+05	
EXPQUAD	120	14	14	-3.6259621e+06		19	17	-3.6259621e+06	
HADAMALS	400	0	0	7.9610000e+03		0	0	7.9610000e+03	
HARKERP2	500	30	30	7.1825620e+01		19	19	3.5314015e+01	

Table 2: Results on CUTest BC problems (continued)

Name	n	pdb				pdproj			
		fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HART6	6	10	10	-3.3228869e+00		7	6	-3.3228869e+00	
HATFLDA	4	0	0	1.7500000e-14		0	0	1.7500000e-14	
HATFLDB	4	10	10	5.6062619e-03		7	7	5.5727138e-03	
HATFLDC	25	6	6	8.1985780e-11		1	1	1.9190224e-08	
HIMMELP1	2	14	14	-6.2053935e+01		6	6	-2.3897419e+01	
HOLMES	180	25	25	1.2483048e+03		255	38	1.2481503e+03	
HS1	2	33	31	6.2221360e-12		32	25	2.5477836e-18	
HS2	2	18	17	4.9412290e+00		24	9	4.9412278e+00	
HS3	2	6	6	7.1039773e-09		1	1	9.9990001e-05	
HS3MOD	2	6	6	-5.4210109e-20		1	1	9.9990001e-05	
HS4	2	7	7	2.6667783e+00		4	4	2.6667279e+00	
HS5	2	8	8	-1.9132229e+00		4	4	-1.9132230e+00	
HS25	3	0	0	3.2835000e+01		0	0	3.2835000e+01	
HS38	4	53	43	2.1261371e-11		55	39	4.6472916e-21	
HS45	5	9	9	1.0013313e+00		4	4	9.9980399e-01	
HS110	10	5	5	-4.5778475e+01		4	4	-4.5778476e+01	
JNLBRNG1	529	10	10	-1.7838964e-01		8	8	-1.7905125e-01	
JNLBRNG2	529	11	11	-4.0970021e+00		8	8	-4.1000885e+00	
JNLBRNGA	529	10	10	-3.0694357e-01		8	8	-3.0752044e-01	
JNLBRNGB	529	13	13	-6.5030146e+00		8	8	-6.5045452e+00	
KOEBHELB	3	24	24	7.7516347e+01		1	1	1.1417234e+02	
LINVERSE	199	96	95	6.8000000e+01		18	16	6.8000002e+01	
LMINSURF	121	380	55	9.0000000e+00		380	55	9.0000000e+00	
LOGROS	2	0	0	0.0000000e+00		0	0	0.0000000e+00	
MAXLIKA	8	19	19	1.1493465e+03		27	22	1.1493476e+03	
MCCORMCK	500	9	9	-4.5707717e+02		5	5	-4.5707725e+02	
MDHOLE	2	63	51	-3.3741598e-05		58	40	-1.1074360e-09	
MINSURF	64	-	-	7.2222683e+11	a	-	-	7.2222683e+11	a
MINSURFO	731	14	14	2.5292047e+00		19	10	2.5288913e+00	
NCVXBQP1	100	-	-	-1.9953446e+06	itn	15	14	-1.9955786e+06	
NCVXBQP2	100	-	-	-1.3328572e+06	itn	30	22	-1.3330455e+06	
NCVXBQP3	100	446	446	-6.6013248e+05		22	22	-6.6013296e+05	
NLMSURF	961	656	73	3.8571709e+01		656	73	3.8571709e+01	
NOBNDTOR	484	10	10	-4.9564362e-01		6	6	-4.9803500e-01	
NONSCOMP	500	20	20	2.1087051e-04		12	12	2.7936007e-03	
OBSTCLAE	529	10	10	1.6817811e+00		7	7	1.6780596e+00	
OBSTCLAL	529	10	10	1.6817805e+00		7	7	1.6780596e+00	
OBSTCLBL	529	8	8	6.5306184e+00		3	3	6.5237471e+00	
OBSTCLBM	529	8	8	6.5306184e+00		3	3	6.5237471e+00	
OBSTCLBU	529	8	8	6.5306184e+00		3	3	6.5237471e+00	
ODC	144	8	8	-1.0980162e-02		8	8	-1.0980162e-02	
OSLBQP	8	9	9	6.2505272e+00		6	6	6.2506134e+00	
PALMER1	4	30	28	1.1754603e+04		18	17	1.1754603e+04	
PALMER1A	6	60	56	8.9883058e-02		59	49	8.9883058e-02	
PALMER1B	4	26	26	3.4473495e+00		33	23	3.4473495e+00	
PALMER1E	8	63	57	8.3523221e-04		70	55	8.3523216e-04	
PALMER2	4	23	23	3.6510975e+03		58	46	3.6510975e+03	
PALMER2A	6	91	78	1.7109717e-02		93	77	1.7109717e-02	
PALMER2B	4	22	21	6.2326690e-01		10	10	6.2326690e-01	
PALMER2E	8	77	64	2.0650359e-04		79	59	2.0650366e-04	
PALMER3	4	18	18	2.2659582e+03		46	43	2.2659582e+03	
PALMER3A	6	102	86	2.0431598e-02		113	79	2.0433195e-02	
PALMER3B	4	22	21	4.2276473e+00		25	16	4.2276473e+00	
PALMER3E	8	59	51	5.0741166e-05		58	48	5.0741053e-05	
PALMER4	4	25	24	2.2853832e+03		15	13	2.2853832e+03	
PALMER4A	6	67	59	4.0606141e-02		59	49	4.0606141e-02	
PALMER4B	4	20	20	6.8351386e+00		8	8	5.8958736e+02	
PALMER4E	8	44	41	1.4800363e-04		45	37	1.4800348e-04	
PALMER5A	8	-	-	8.4457494e-02	itn	-	-	8.5372644e-02	itn
PALMER5B	9	639	425	9.7524182e-03		708	442	9.7524817e-03	

Table 2: Results on CUTEst BC problems (continued)

Name	n	pdb				pdproj			
		fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
PALMER5D	4	1	1	8.7339395e+01		1	1	8.7339395e+01	
PALMER5E	8	-	-	2.4784293e-02	itn	-	-	2.4744599e-02	itn
PALMER6A	6	143	122	5.5948854e-02		166	126	5.5948854e-02	
PALMER6E	8	55	48	2.2395468e-04		56	43	2.2395473e-04	
PALMER7A	6	-	-	1.0429514e+01	itn	-	-	1.0458103e+01	itn
PALMER7E	8	269	193	1.0153899e+01		287	167	1.0153899e+01	
PALMER8A	6	45	43	7.4009699e-02		44	32	7.4009699e-02	
PALMER8E	8	29	29	6.3393063e-03		20	18	6.3393062e-03	
PENTDI	500	8	8	-6.7237284e-01		7	7	-7.0407791e-01	
PFIT1LS	3	16	15	9.4656790e+02		371	252	5.4827122e-10	
PFIT2LS	3	120	103	9.5807882e-14		169	118	7.5888057e-15	
PFIT3LS	3	151	122	1.9492158e-14		149	111	4.3719613e-13	
PFIT4LS	3	284	216	1.7425348e-14		293	204	1.0081713e-14	
PROBPENL	500	13	13	3.9835673e-07		4	4	3.9907171e-07	
PSPDOC	4	9	6	2.4143465e+00		8	5	2.4142136e+00	
QR3DLS	610	298	209	4.4261354e-12		307	196	6.2798164e-08	
QRTQUAD	120	30	30	-3.6246319e+06		29	26	-3.6241384e+06	
QUDLIN	120	11	11	-7.1989494e+05		3	3	-7.1999284e+05	
RAYBENDL	130	8	8	9.6245209e+01		8	8	9.6245209e+01	
RAYBENDS	130	8	8	9.6242362e+01		8	8	9.6242362e+01	
S368	100	0	0	0.0000000e+00		0	0	0.0000000e+00	
SCOND1LS	502	457	391	7.8265400e-10		443	361	1.4706991e-10	
SIM2BQP	2	8	8	3.8002608e-05		2	2	5.2762788e-05	
SIMBQP	2	11	11	1.0046365e-05		5	5	7.6287136e-07	
SINEALI	100	25	24	-9.9009616e+03		9	9	-9.9009616e+03	
SPECAN	9	18	18	2.3380008e-12		13	9	1.6461587e-11	
SSC	1122	1	1	-2.0779891e+00		1	1	-2.0779891e+00	
TORSION1	484	9	9	-4.4963517e-01		3	3	-4.5203677e-01	
TORSION2	484	9	9	-4.4963517e-01		3	3	-4.5203677e-01	
TORSION3	484	9	9	-1.2355333e+00		5	5	-1.2422440e+00	
TORSION4	484	9	9	-1.2355333e+00		5	5	-1.2422440e+00	
TORSION5	484	9	9	-2.8795420e+00		5	5	-2.8846941e+00	
TORSION6	484	9	9	-2.8795420e+00		5	5	-2.8846941e+00	
TORSIONA	484	8	8	-4.0913758e-01		3	3	-4.1049415e-01	
TORSIONB	484	8	8	-4.0913758e-01		3	3	-4.1049415e-01	
TORSIONC	484	9	9	-1.1949639e+00		4	4	-1.1993013e+00	
TORSIOND	484	9	9	-1.1949639e+00		4	4	-1.1993013e+00	
TORSIONE	484	9	9	-2.8362224e+00		5	5	-2.8405853e+00	
TORSIONF	484	9	9	-2.8362224e+00		5	5	-2.8405853e+00	
WEEDS	3	41	41	2.5872774e+00		49	45	2.5872774e+00	
YFIT	3	69	61	6.9972759e-13		49	40	6.7347113e-13	

Table 3: Results on small CUTEst quadratic programming (QP) problems

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
AVGASA	8	10	10	10	-4.6319558e+00		6	6	-4.6319254e+00	
AVGASB	8	10	10	10	-4.4832024e+00		5	5	-4.4830561e+00	
BIGGSC4	4	7	15	15	-2.4498070e+01		8	8	-2.4374923e+01	
BLOCKQP1	210	101	7	7	4.9900203e+00		1	1	4.9900190e+00	
BLOCKQP2	210	101	21	21	-9.3809657e+01		2	2	4.9644811e+00	
BLOCKQP3	210	101	8	8	4.9820294e+00		1	1	4.9850447e+00	
BLOCKQP4	210	101	12	12	-4.5776185e+01		2	2	4.7823818e+00	
BLOCKQP5	210	101	10	10	4.9807687e+00		1	1	4.9849443e+00	
BLOWEYA	202	102	9	9	-2.0946023e-01		3	3	-5.5354723e-03	
BLOWEYB	202	102	1	1	-3.8161465e-04		1	1	-4.7761959e-04	

Table 3: Results on “small” CUTEst QPs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
BLOWEYC	202	102	11	11	-2.5215101e-01		4	4	-3.9617089e-03	
CVXQP1	100	50	23	23	1.1590788e+04		10	10	1.1590779e+04	
CVXQP2	100	25	12	12	8.1211270e+03		7	7	8.1209352e+03	
CVXQP3	100	75	33	33	1.1943343e+04		25	25	1.1943340e+04	
DEGENQP	10	1005	8	8	1.8861455e-01		2	2	0.0000000e+00	
DEGENQPC	10	125	9	9	1.1530913e-02		3	3	0.0000000e+00	
DTOC3	299	198	2	2	2.3426647e+02		2	2	2.3426647e+02	
DUAL1	85	1	87	87	3.5612389e-02		12	12	3.5019836e-02	
DUAL2	96	1	67	67	3.3934246e-02		11	11	3.3755849e-02	
DUAL3	111	1	115	115	1.3657364e-01		12	12	1.3576742e-01	
DUAL4	75	1	50	50	7.4969846e-01		10	10	7.4635732e-01	
DUALC1	9	215	59	59	7.5450217e+03		81	17	6.1005950e+03	
DUALC2	7	229	32	32	2.9384452e+03		56	12	4.2615445e+03	
DUALC5	8	278	13	13	4.1401309e+02		9	8	4.2753204e+02	
DUALC8	8	503	44	44	1.6184715e+04		247	36	1.3976656e+04	
FERRISDC	44	14	18	18	4.8157512e-04		5	5	8.9864181e-04	
GENHS28	10	8	1	1	9.2731430e-01		1	1	9.2731430e-01	
GMNCASE1	175	300	10	10	2.5473750e-01		33	33	2.6697318e-01	
GMNCASE2	175	1050	9	9	-1.0288334e+00		6	6	-9.9434819e-01	
GMNCASE3	175	1050	13	13	1.4956231e+00		5	5	1.5251477e+00	
GMNCASE4	175	350	49	49	5.9468845e+03		12	12	5.9469406e+03	
GOULDQP1	32	17	45	45	-3.4852762e+03		25	15	-3.4853332e+03	
GRIDNETA	180	100	13	13	9.5241045e+01		3	3	9.5243682e+01	
GRIDNETB	180	100	2	2	4.7268227e+01		2	2	4.7268227e+01	
GRIDNETC	180	100	13	13	4.8352681e+01		5	5	4.8362395e+01	
HATFLDH	4	7	13	13	-2.4499821e+01		8	7	-2.4500041e+01	
HIE1372D	637	525	19	19	2.7798781e+02		7	7	2.7799128e+02	
HS21	2	1	9	9	-9.9959997e+01		22	8	-9.9960000e+01	
HS268	5	5	19	19	4.4591241e-05		5	5	4.5543347e-05	
HS35	3	1	8	8	1.1120968e-01		4	4	1.1121285e-01	
HS35I	3	1	8	8	1.1120020e-01		4	4	1.1117474e-01	
HS35MOD	3	1	10	10	2.5005545e-01		6	6	2.5009036e-01	
HS44	4	6	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS44NEW	4	6	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS51	5	3	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS52	5	3	2	2	5.3266416e+00		2	2	5.3266416e+00	
HS53	5	3	8	8	4.0928843e+00		3	3	4.0930243e+00	
HS76	4	3	10	10	-4.6817534e+00		6	6	-4.6818182e+00	
HS76I	4	3	10	10	-4.6817569e+00		6	6	-4.6818182e+00	
HS118	15	17	24	24	6.6482149e+02		36	13	6.6482045e+02	
HUES-MOD	100	2	56	56	3.4829821e+07		12	11	3.4829821e+07	
HUESTIS	100	2	72	72	3.4829823e+09		14	14	3.4829820e+09	
KSIP	20	1001	5	5	2.5457988e+00		2	2	4.4826266e+00	
LISWET1	403	400	8	8	1.0001535e+00		4	4	1.0034516e+00	
LISWET2	403	400	8	8	1.0021352e+00		4	4	1.0058694e+00	
LISWET3	403	400	8	8	1.0021352e+00		4	4	1.0058694e+00	
LISWET4	403	400	8	8	1.0021337e+00		4	4	1.0058682e+00	
LISWET5	403	400	8	8	1.0021346e+00		4	4	1.0058688e+00	
LISWET6	403	400	8	8	1.0021353e+00		4	4	1.0058695e+00	
LISWET7	403	400	8	8	1.0021350e+00		4	4	1.0058693e+00	
LISWET8	403	400	8	8	1.0021680e+00		4	4	1.0059149e+00	
LISWET9	102	100	90	90	1.9592123e+01		180	45	1.9946955e+01	
LISWET10	403	400	8	8	1.0021332e+00		4	4	1.0058690e+00	
LISWET11	403	400	8	8	1.0021355e+00		4	4	1.0058698e+00	
LISWET12	403	400	8	8	1.0020907e+00		4	4	1.0058583e+00	
MOSARQP1	100	10	9	9	-1.5414696e+02		5	5	-1.5420010e+02	
MOSARQP2	100	10	8	8	-2.0648886e+02		4	4	-2.0651313e+02	
NASH	72	24	18	18	0.0000000e+00	Stny	5	5	0.0000000e+00	Stny
NCVXQP1	100	50	370	370	-7.2975675e+05		32	23	-7.2975368e+05	
NCVXQP2	100	50	475	475	-5.4468467e+05		31	25	-5.4468253e+05	

Table 3: Results on “small” CUTEst QPs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
NCVXQP3	100	50	402	402	-2.8981710e+05		53	25	-2.8981966e+05	
NCVXQP4	100	25	-	-	-9.0923252e+05	itn	27	24	-9.1739441e+05	
NCVXQP5	100	25	-	-	-6.3452442e+05	itn	87	31	-6.3384678e+05	
NCVXQP6	100	25	378	378	-3.2702971e+05		28	23	-3.2703079e+05	
NCVXQP7	100	75	241	241	-4.9111803e+05		56	21	-4.9111132e+05	
NCVXQP8	100	75	334	328	-3.4298487e+05		52	27	-3.4298333e+05	
NCVXQP9	100	75	266	266	-2.1120750e+05		52	25	-2.1325187e+05	
PORTSNQP	1000	2	20	20	3.3177891e+02		20	12	3.3177837e+02	
PORTSQP	1000	1	13	13	3.3141674e+02		5	5	3.3141799e+02	
POWELL20	100	100	89	89	5.2702704e+04		42	24	5.2702970e+04	
PRIMAL1	325	85	8	8	3.7575390e-01		9	9	-3.5012939e-02	
PRIMAL2	649	96	9	9	1.0977129e-01		5	5	-3.3707235e-02	
PRIMAL3	745	111	8	8	9.2213550e-02		5	5	-1.3556172e-01	
PRIMAL4	1489	75	11	11	-7.4365458e-01		6	5	-7.4608803e-01	
PRIMALC1	230	9	179	179	-6.4786379e+03		910	67	-6.1086369e+03	
PRIMALC2	231	7	310	310	-3.5697328e+03		1974	136	-3.5592901e+03	
PRIMALC5	287	8	78	78	-4.2727207e+02		473	40	-4.2589147e+02	
PRIMALC8	520	8	136	136	-1.8313568e+04		1445	100	-1.8314365e+04	
QPCBLEND	83	74	16	16	1.0036500e-01		9	9	1.3765326e-02	
QPCBOE12	143	166	416	416	8.0140603e+06		18	17	8.0019935e+06	
QPNBLEND	83	74	22	22	6.1570504e-02		9	9	2.0140201e-02	
QPNBOE11	384	351	347	347	6.8225885e+06		89	44	6.7596063e+06	
QPNBOE12	143	166	-	-	1.1032067e+06	itn	66	33	1.3684173e+06	
QPNSTAIR	467	356	472	472	5.1456170e+06		53	33	5.1460333e+06	
RDW2D51F	578	225	7	7	2.5442835e-03		1	1	3.0446262e-03	
RDW2D51U	578	225	1	1	8.3924280e-04		1	1	8.3924280e-04	
RDW2D52B	578	225	51	51	1.0949515e-02		10	10	1.1073435e-02	
RDW2D52F	578	225	2	2	1.0867471e-02		1	1	1.0822902e-02	
RDW2D52U	578	225	1	1	1.0454949e-02		1	1	1.0454949e-02	
S268	5	5	19	19	4.4591241e-05		5	5	4.5543347e-05	
SOSQP1	200	101	11	11	-1.7742886e-08		2	2	-2.0609014e-03	
SOSQP2	200	101	13	13	-4.8736980e+01		7	7	-4.8737318e+01	
STATIC3	434	96	-	-	-3.8078926e+43	itn	-	-	-2.5733017e+45	itn
STCQP1	257	128	13	13	4.0405145e+03		5	5	4.0408537e+03	
STCQP2	257	128	10	10	1.4294680e+03		6	6	1.4294615e+03	
STEENBRA	432	108	54	54	1.6957674e+04		153	30	1.6957686e+04	
STNQP1	257	128	13	13	-4.4729819e+03		5	5	-4.4728241e+03	
STNQP2	257	128	13	13	-7.2319867e+03		5	5	-7.2320005e+03	
TAME	2	1	6	6	0.0000000e+00		2	2	3.0814879e-33	
TARGUS	162	63	20	20	1.0837992e+03		6	6	1.0838013e+03	
TWOD	31	10	9	9	3.3589725e-03		3	3	3.8076029e-03	
UBH1	99	60	23	23	1.1473519e+00		8	8	8.1610475e+00	
WALL10	1461	0	-	-	-4.5595180e+05	itn	102	25	-4.5595398e+05	
YAO	202	200	73	73	1.0057670e+01		925	240	1.5265744e+01	
ZECEVIC2	2	2	9	9	-4.1250714e+00		4	4	-4.1249999e+00	

Table 4: Results on small CUTEst linearly constrained (LC) problems

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
AGG	163	488	-	-	-3.9271499e+07	itn	472	50	-3.5992738e+07	
ANTWERP	27	10	187	184	3.2452406e+03		105	25	3.5018331e+04	
AVGASA	8	10	10	10	-4.6319558e+00		6	6	-4.6319254e+00	
AVGASB	8	10	10	10	-4.4832024e+00		5	5	-4.4830561e+00	
AVION2	49	15	68	68	9.4687921e+07		25	25	9.4686725e+07	
BIGGSC4	4	7	15	15	-2.4498070e+01		8	8	-2.4374923e+01	

Table 4: Results on “small” CUTEst LCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
BLOCKQP1	210	101	7	7	4.9900203e+00		1	1	4.9900190e+00	
BLOCKQP2	210	101	21	21	-9.3809657e+01		2	2	4.9644811e+00	
BLOCKQP3	210	101	8	8	4.9820294e+00		1	1	4.9850447e+00	
BLOCKQP4	210	101	12	12	-4.5776185e+01		2	2	4.7823818e+00	
BLOCKQP5	210	101	10	10	4.9807687e+00		1	1	4.9849443e+00	
BLOWEYA	202	102	9	9	-2.0946023e-01		3	3	-5.5354723e-03	
BLOWEYB	202	102	1	1	-3.8161465e-04		1	1	-4.7761959e-04	
BLOWEYC	202	102	11	11	-2.5215101e-01		4	4	-3.9617089e-03	
BT3	5	3	2	2	4.0930208e+00		2	2	4.0930208e+00	
CVXQP1	100	50	23	23	1.1590788e+04		10	10	1.1590779e+04	
CVXQP2	100	25	12	12	8.1211270e+03		7	7	8.1209352e+03	
CVXQP3	100	75	33	33	1.1943343e+04		25	25	1.1943340e+04	
DALLASM	196	151	36	36	-4.8198167e+04		11	10	-4.8198123e+04	
DALLASS	46	31	26	26	-3.2393224e+04		14	11	-3.2393223e+04	
DEGENLPA	20	15	11	11	-9.1117048e-04		3	3	-1.0358025e-03	
DEGENLPB	20	15	38	38	-7.0792202e+01		34	30	-5.2290671e+01	
DEGENQP	10	1005	8	8	1.8861455e-01		2	2	0.0000000e+00	
DEGENQPC	10	125	9	9	1.1530913e-02		3	3	0.0000000e+00	
DTOC1L	298	196	7	7	2.2994187e-01		7	7	2.2994187e-01	
DTOC3	299	198	2	2	2.3426647e+02		2	2	2.3426647e+02	
DUAL1	85	1	87	87	3.5612389e-02		12	12	3.5019836e-02	
DUAL2	96	1	67	67	3.3934246e-02		11	11	3.3755849e-02	
DUAL3	111	1	115	115	1.3657364e-01		12	12	1.3576742e-01	
DUAL4	75	1	50	50	7.4969846e-01		10	10	7.4635732e-01	
DUALC1	9	215	59	59	7.5450217e+03		81	17	6.1005950e+03	
DUALC2	7	229	32	32	2.9384452e+03		56	12	4.2615445e+03	
DUALC5	8	278	13	13	4.1401309e+02		9	8	4.2753204e+02	
DUALC8	8	503	44	44	1.6184715e+04		247	36	1.3976656e+04	
EQC	9	3	-	-	-8.3373143e+02	1s	-	-	-8.5141094e+02	1s
EXPFITA	5	22	18	18	1.1538758e-03		15	14	1.2316317e-03	
EXPFITB	5	102	37	37	5.0195461e-03		63	44	5.0082144e-03	
EXPFITC	5	502	62	62	2.3302240e-02		94	69	2.3294873e-02	
EXTRASIM	2	1	6	6	1.0000000e+00		1	1	1.0001000e+00	
FCCU	19	8	14	14	1.1149059e+01		4	4	1.1149109e+01	
FERRISDC	44	14	18	18	4.8157512e-04		5	5	8.9864181e-04	
GENHS28	10	8	1	1	9.2731430e-01		1	1	9.2731430e-01	
GMNCASE1	175	300	10	10	2.5473750e-01		33	33	2.6697318e-01	
GMNCASE2	175	1050	9	9	-1.0288334e+00		6	6	-9.9434819e-01	
GMNCASE3	175	1050	13	13	1.4956231e+00		5	5	1.5251477e+00	
GMNCASE4	175	350	49	49	5.9468845e+03		12	12	5.9469406e+03	
GOFFIN	51	50	8	8	8.6367647e-02		17	10	-5.6556424e-10	
GOULDQP1	32	17	45	45	-3.4852762e+03		25	15	-3.4853332e+03	
GRIDNETA	180	100	13	13	9.5241045e+01		3	3	9.5243682e+01	
GRIDNETB	180	100	2	2	4.7268227e+01		2	2	4.7268227e+01	
GRIDNETC	180	100	13	13	4.8352681e+01		5	5	4.8362395e+01	
GRIDNETD	180	100	13	13	9.9246835e+01		3	3	9.9249540e+01	
GRIDNETE	180	100	2	2	5.0601275e+01		2	2	5.0601275e+01	
GRIDNETF	180	100	12	12	5.1648844e+01		5	5	5.1656291e+01	
GRIDNETG	60	36	13	13	7.3449032e+01		3	3	7.3449359e+01	
GRIDNETH	60	36	2	2	3.9609938e+01		2	2	3.9609938e+01	
GRIDNETI	60	36	12	12	4.0223427e+01		5	5	4.0226967e+01	
HAGER1	201	100	1	1	8.8079749e-01		1	1	8.8079749e-01	
HAGER2	201	100	1	1	4.3208693e-01		1	1	4.3208693e-01	
HAGER3	201	100	1	1	1.4096195e-01		1	1	1.4096195e-01	
HAGER4	201	100	10	10	2.7969265e+00		1	1	3.5427938e+00	
HATFLDH	4	7	13	13	-2.4499821e+01		8	7	-2.4500041e+01	
HIE1372D	637	525	19	19	2.7798781e+02		7	7	2.7799128e+02	
HIMMELBI	100	12	105	105	-1.7355646e+03		124	31	-1.7355696e+03	
HIMMELBJ	45	14	54	34	-1.9103432e+03		-	-	-1.9101213e+03	1s
HONG	4	1	10	10	2.2570194e+01		6	6	2.2570957e+01	

Table 4: Results on “small” CUTEst LCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS9	2	1	5	5	-5.0000000e-01		5	5	-5.0000000e-01	
HS21	2	1	9	9	-9.9959997e+01		22	8	-9.9960000e+01	
HS21MOD	7	1	10	10	-9.5959377e+01		23	10	-9.5959847e+01	
HS24	2	3	19	19	-1.0000008e+00		6	5	-1.0000011e+00	
HS268	5	5	19	19	4.4591241e-05		5	5	4.5543347e-05	
HS28	3	1	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS35	3	1	8	8	1.1120968e-01		4	4	1.1121285e-01	
HS35I	3	1	8	8	1.1120020e-01		4	4	1.1117474e-01	
HS35MOD	3	1	10	10	2.5005545e-01		6	6	2.5009036e-01	
HS36	3	1	13	13	-3.2992995e+03		8	8	-8.9987954e-12	
HS37	3	2	16	16	-3.4560075e+03		6	6	-3.4559843e+03	
HS41	4	1	9	9	1.9259481e+00		6	5	1.9259235e+00	
HS44	4	6	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS44NEW	4	6	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS48	5	2	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS49	5	2	11	11	4.5732460e-06		11	11	4.5732460e-06	
HS50	5	3	8	8	8.4129508e-13		8	8	8.4129508e-13	
HS51	5	3	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS52	5	3	2	2	5.3266416e+00		2	2	5.3266416e+00	
HS53	5	3	8	8	4.0928843e+00		3	3	4.0930243e+00	
HS54	6	1	17	17	-8.6731969e-01		2	2	-1.5396022e-01	
HS55	6	6	10	10	6.3333518e+00		7	7	6.3333365e+00	
HS62	3	1	17	17	-2.6273076e+04		18	13	-2.6272951e+04	
HS76	4	3	10	10	-4.6817534e+00		6	6	-4.6818182e+00	
HS76I	4	3	10	10	-4.6817569e+00		6	6	-4.6818182e+00	
HS86	5	10	13	13	-3.2348648e+01		5	5	-3.2346516e+01	
HS105	8	1	25	25	1.0446823e+03		31	16	1.0446106e+03	
HS112	10	3	6	6	-4.7758084e+01		9	9	-4.7757612e+01	
HS118	15	17	24	24	6.6482149e+02		36	13	6.6482045e+02	
HS119	16	8	18	18	2.4491043e+02		8	8	2.4489998e+02	
HUBFIT	2	1	8	8	1.6922104e-02		5	5	1.6990943e-02	
HUES-MOD	100	2	56	56	3.4829821e+07		12	11	3.4829821e+07	
HUESTIS	100	2	72	72	3.4829823e+09		14	14	3.4829820e+09	
HYDROELM	505	504	-	-	-3.4737640e+06	itn	-	-	-3.5360586e+06	itn
HYDROELS	169	168	-	-	-3.5173340e+06	itn	-	-	-3.5807264e+06	itn
KSIP	20	1001	5	5	2.5457988e+00		2	2	4.4826266e+00	
LCH	300	1	16	16	-4.2581443e+00		16	16	-4.2581443e+00	
LIN	4	2	3	3	-1.7577590e-02		1	1	-1.7578034e-02	
LINSPANH	97	33	9	9	-7.7000001e+01		3	3	-7.7000000e+01	
LISWET1	403	400	8	8	1.0001535e+00		4	4	1.0034516e+00	
LISWET2	403	400	8	8	1.0021352e+00		4	4	1.0058694e+00	
LISWET3	403	400	8	8	1.0021352e+00		4	4	1.0058694e+00	
LISWET4	403	400	8	8	1.0021337e+00		4	4	1.0058682e+00	
LISWET5	403	400	8	8	1.0021346e+00		4	4	1.0058688e+00	
LISWET6	403	400	8	8	1.0021353e+00		4	4	1.0058695e+00	
LISWET7	403	400	8	8	1.0021350e+00		4	4	1.0058693e+00	
LISWET8	403	400	8	8	1.0021680e+00		4	4	1.0059149e+00	
LISWET9	102	100	90	90	1.9592123e+01		180	45	1.9946955e+01	
LISWET10	403	400	8	8	1.0021332e+00		4	4	1.0058690e+00	
LISWET11	403	400	8	8	1.0021355e+00		4	4	1.0058698e+00	
LISWET12	403	400	8	8	1.0020907e+00		4	4	1.0058583e+00	
LOADBAL	31	31	11	11	4.8848176e-01		9	6	4.9991489e-01	
LOTSCHD	12	7	21	21	2.3984127e+03		6	6	2.3984154e+03	
LSNODOC	5	4	12	12	1.2311716e+02		7	7	1.2311245e+02	
LSQFIT	2	1	7	7	3.3873476e-02		5	5	3.3790279e-02	
MAKELA4	21	40	11	11	8.8491964e-04		4	4	5.3353682e-05	
MODEL	1542	38	20	20	0.0000000e+00		8	5	0.0000000e+00	
MOSARQP1	100	10	9	9	-1.5414696e+02		5	5	-1.5420010e+02	
MOSARQP2	100	10	8	8	-2.0648886e+02		4	4	-2.0651313e+02	
NASH	72	24	18	18	0.0000000e+00	Sty	5	5	0.0000000e+00	Sty

Table 4: Results on “small” CUTEst LCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
NCVXQP1	100	50	370	370	-7.2975675e+05		32	23	-7.2975368e+05	
NCVXQP2	100	50	475	475	-5.4468467e+05		31	25	-5.4468253e+05	
NCVXQP3	100	50	402	402	-2.8981710e+05		53	25	-2.8981966e+05	
NCVXQP4	100	25	-	-	-9.0923252e+05	itn	27	24	-9.1739441e+05	
NCVXQP5	100	25	-	-	-6.3452442e+05	itn	87	31	-6.3384678e+05	
NCVXQP6	100	25	378	378	-3.2702971e+05		28	23	-3.2703079e+05	
NCVXQP7	100	75	241	241	-4.9111803e+05		56	21	-4.9111132e+05	
NCVXQP8	100	75	334	328	-3.4298487e+05		52	27	-3.4298333e+05	
NCVXQP9	100	75	266	266	-2.1120750e+05		52	25	-2.1325187e+05	
ODFITS	10	6	20	20	-2.3800268e+03		7	7	-2.3800268e+03	
OET1	3	202	16	16	5.3818400e-01		294	85	5.3819574e-01	
OET3	4	202	5	5	7.6341326e-02		9	9	4.5013148e-03	
PDE1	26	51	11	11	1.1022354e+00		6	6	1.1015625e+00	
PDE2	40	51	8	8	9.0609452e+00		5	5	9.0546876e+00	
PENTAGON	6	15	45	45	1.6973505e-04		26	22	1.4200788e-04	
PORTFL1	12	1	12	12	2.0643471e-02		12	7	2.0521009e-02	
PORTFL2	12	1	12	12	2.9889667e-02		9	6	2.9729633e-02	
PORTFL3	12	1	12	12	3.2933319e-02		14	7	3.2766803e-02	
PORTFL4	12	1	11	11	2.6648672e-02		14	7	2.6344700e-02	
PORTFL6	12	1	11	11	2.6101266e-02		9	6	2.5814940e-02	
PORTSNQP	1000	2	20	20	3.3177891e+02		20	12	3.3177837e+02	
PORTSQP	1000	1	13	13	3.3141674e+02		5	5	3.3141799e+02	
POWELL20	100	100	89	89	5.2702704e+04		42	24	5.2702970e+04	
PRIMAL1	325	85	8	8	3.7575390e-01		9	9	-3.5012939e-02	
PRIMAL2	649	96	9	9	1.0977129e-01		5	5	-3.3707235e-02	
PRIMAL3	745	111	8	8	9.2213550e-02		5	5	-1.3556172e-01	
PRIMAL4	1489	75	11	11	-7.4365458e-01		6	5	-7.4608803e-01	
PRIMALC1	230	9	179	179	-6.4786379e+03		910	67	-6.1086369e+03	
PRIMALC2	231	7	310	310	-3.5697328e+03		1974	136	-3.5592901e+03	
PRIMALC5	287	8	78	78	-4.2727207e+02		473	40	-4.2589147e+02	
PRIMALC8	520	8	136	136	-1.8313568e+04		1445	100	-1.8314365e+04	
PT	2	101	12	12	1.7832735e-01		29	25	1.7838242e-01	
QC	9	4	21	21	-9.5653731e+02		15	13	-9.5653798e+02	
QCNEW	9	3	0	0	-	undf	0	0	-	undf
QPCBLEND	83	74	16	16	1.0036500e-01		9	9	1.3765326e-02	
QPCBOEI2	143	166	416	416	8.0140603e+06		18	17	8.0019935e+06	
QPNBLEND	83	74	22	22	6.1570504e-02		9	9	2.0140201e-02	
QPNBOEI1	384	351	347	347	6.8225885e+06		89	44	6.7596063e+06	
QPNBOEI1	384	351	347	347	6.8225885e+06		89	44	6.7596063e+06	
QPNBOEI2	143	166	-	-	1.1032067e+06	itn	66	33	1.3684173e+06	
QPNSTAIR	467	356	472	472	5.1456170e+06		53	33	5.1460333e+06	
QPNSTAIR	467	356	472	472	5.1456170e+06		53	33	5.1460333e+06	
RDW2D51F	578	225	7	7	2.5442835e-03		1	1	3.0446262e-03	
RDW2D51U	578	225	1	1	8.3924280e-04		1	1	8.3924280e-04	
RDW2D52B	578	225	51	51	1.0949515e-02		10	10	1.1073435e-02	
RDW2D52F	578	225	2	2	1.0867471e-02		1	1	1.0822902e-02	
RDW2D52U	578	225	1	1	1.0454949e-02		1	1	1.0454949e-02	
READING2	303	200	0	0	0.0000000e+00		0	0	0.0000000e+00	
S268	5	5	19	19	4.4591241e-05		5	5	4.5543347e-05	
S277-280	4	4	6	6	5.0761905e+00		1	1	5.0766034e+00	
SIMPLLPA	2	2	8	8	1.0001520e+00		5	5	1.0000000e+00	
SIMPLLPB	2	3	8	8	1.1000292e+00		5	5	1.1000000e+00	
SIPOW1	2	100	22	22	-1.0000583e+00		61	54	-1.0000045e+00	
SIPOW1M	2	100	25	25	-1.0005190e+00		536	177	-1.0004937e+00	
SIPOW2	2	100	25	25	-1.0019779e+00		137	77	-1.0019772e+00	
SIPOW2M	2	100	20	20	-1.0000100e+00		13	8	-1.0000001e+00	
SIPOW3	4	100	13	13	5.0391607e-01		12	12	5.0397244e-01	
SIPOW4	4	100	12	12	2.6099919e-01		9	9	2.6110704e-01	
SMBANK	117	64	32	32	-7.1292913e+06		10	10	-7.1292920e+06	
SOSQP1	200	101	11	11	-1.7742886e-08		2	2	-2.0609014e-03	

Table 4: Results on “small” CUTEst LCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
SOSQP2	200	101	13	13	-4.8736980e+01		7	7	-4.8737318e+01	
SPANHYD	97	33	227	227	2.4699652e+02		19	19	2.3973800e+02	
SSEBLIN	194	72	219	219	1.6170600e+07		609	39	1.6170600e+07	
STANCMIN	3	2	15	15	4.2497771e+00		5	5	4.2498226e+00	
STATIC3	434	96	-	-	-3.8078926e+43	itn	-	-	-2.5733017e+45	itn
STCQP1	257	128	13	13	4.0405145e+03		5	5	4.0408537e+03	
STCQP2	257	128	10	10	1.4294680e+03		6	6	1.4294615e+03	
STEENBRA	432	108	54	54	1.6957674e+04		153	30	1.6957686e+04	
STEENBRB	468	108	-	-	1.1961647e+04	itn	-	-	9.6721969e+04	itn
STEENBRC	540	126	366	366	2.7520862e+04		-	-	1.8984483e+11	itn
STEENBRD	468	108	207	207	9.4396084e+03		-	-	2.3176466e+08	itn
STEENBRE	540	126	400	400	2.8875080e+04		-	-	5.9840408e+10	itn
STEENBRF	468	108	-	-	1.0296816e+04	itn	-	-	1.5501452e+06	itn
STEENBRG	540	126	256	256	2.7426341e+04		-	-	1.8537217e+11	itn
STNQP1	257	128	13	13	-4.4729819e+03		5	5	-4.4728241e+03	
STNQP2	257	128	13	13	-7.2319867e+03		5	5	-7.2320005e+03	
SUPERSIM	2	2	6	6	6.6666654e-01		2	2	6.6664814e-01	
TAME	2	1	6	6	0.0000000e+00		2	2	3.0814879e-33	
TARGUS	162	63	20	20	1.0837992e+03		6	6	1.0838013e+03	
TFI2	3	101	14	14	6.4897835e-01		19	19	6.4895943e-01	
TFI3	3	101	16	16	4.3010055e+00		11	10	4.3011141e+00	
TWOD	31	10	9	9	3.3589725e-03		3	3	3.8076029e-03	
UBH1	99	60	23	23	1.1473519e+00		8	8	8.1610475e+00	
WALL10	1461	0	-	-	-4.5595180e+05	itn	102	25	-4.5595398e+05	
WATER	31	10	63	63	1.0549379e+04		16	9	1.0549379e+04	
YAO	202	200	73	73	1.0057670e+01		925	240	1.5265744e+01	
ZECEVIC2	2	2	9	9	-4.1250714e+00		4	4	-4.1249999e+00	

Table 5: Results on CUTEst Hock-Schittkowski (HS) problems

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS1	0	2	33	31	6.2221360e-12		32	25	2.5477836e-18	
HS2	0	2	18	17	4.9412290e+00		24	9	4.9412278e+00	
HS3	0	2	6	6	7.1039773e-09		1	1	9.9990001e-05	
HS3MOD	0	2	6	6	-5.4210109e-20		1	1	9.9990001e-05	
HS4	0	2	7	7	2.6667783e+00		4	4	2.6667279e+00	
HS5	0	2	8	8	-1.9132229e+00		4	4	-1.9132230e+00	
HS6	1	2	42	12	0.0000000e+00		42	12	0.0000000e+00	
HS7	1	2	32	11	-1.7320554e+00		32	11	-1.7320554e+00	
HS8	2	2	5	4	-1.0000000e+00		5	4	-1.0000000e+00	
HS9	1	2	5	5	-5.0000000e-01		5	5	-5.0000000e-01	
HS10	1	2	9	9	-1.0000336e+00		8	8	-1.0000009e+00	
HS11	1	2	7	7	-8.4985589e+00		5	5	-8.4984641e+00	
HS12	1	2	14	11	-3.0000000e+01		202	27	-3.0000000e+01	
HS13	1	2	35	35	8.8892362e-01		37	37	8.9753859e-01	
HS14	2	2	7	7	1.3934645e+00		4	4	1.3934292e+00	
HS15	2	2	29	29	3.0648861e+02		9	8	3.6038040e+02	
HS16	2	2	11	11	2.5000103e-01		6	5	2.4996008e-01	
HS17	2	2	10	10	1.0000267e+00		5	5	1.0000831e+00	
HS18	2	2	29	21	4.9984800e+00		50	20	4.9992119e+00	
HS19	2	2	33	33	-6.9618499e+03		10	10	-6.9619157e+03	
HS20	3	2	24	24	3.8194331e+01		14	11	3.8198601e+01	
HS21	1	2	9	9	-9.9959997e+01		22	8	-9.9960000e+01	
HS21MOD	1	7	10	10	-9.5959377e+01		23	10	-9.5959847e+01	
HS22	2	2	7	7	1.0000000e+00		3	3	1.0001651e+00	

Table 5: Results on CUTest HS problems (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS23	5	2	17	17	2.0000253e+00		58	22	9.4730587e+00	
HS24	3	2	19	19	-1.0000008e+00		6	5	-1.0000011e+00	
HS25	0	3	0	0	3.2835000e+01		0	0	3.2835000e+01	
HS26	1	3	12	12	2.4660757e-08		12	12	2.4660757e-08	
HS27	1	3	65	12	3.9999999e-02		65	12	3.9999999e-02	
HS28	1	3	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS29	1	3	16	15	-2.2627417e+01		38	13	-2.2627417e+01	
HS30	1	3	9	9	1.0000504e+00		5	5	1.0000001e+00	
HS31	1	3	10	10	6.0000108e+00		5	5	5.9999998e+00	
HS32	2	3	11	11	1.0009733e+00		5	5	9.9999983e-01	
HS33	2	3	14	14	-4.5857388e+00		21	10	-4.5857864e+00	
HS34	2	3	12	12	-8.3402578e-01		22	10	-8.3403247e-01	
HS35	1	3	8	8	1.1120968e-01		4	4	1.1121285e-01	
HS35I	1	3	8	8	1.1120020e-01		4	4	1.1117474e-01	
HS35MOD	1	3	10	10	2.5005545e-01		6	6	2.5009036e-01	
HS36	1	3	13	13	-3.2992995e+03		8	8	-8.9987954e-12	
HS37	2	3	16	16	-3.4560075e+03		6	6	-3.4559843e+03	
HS38	0	4	53	43	2.1261371e-11		55	39	4.6472916e-21	
HS39	2	4	14	11	-1.0000009e+00		14	11	-1.0000009e+00	
HS40	3	4	3	3	-2.5000084e-01		3	3	-2.5000084e-01	
HS41	1	4	9	9	1.9259481e+00		6	5	1.9259235e+00	
HS42	2	4	4	4	1.3857845e+01		4	4	1.3857845e+01	
HS43	3	4	12	12	-4.4000081e+01		7	6	-4.4000000e+01	
HS44	6	4	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS44NEW	6	4	14	14	-1.4999992e+01		15	7	-1.5000000e+01	
HS45	0	5	9	9	1.0013313e+00		4	4	9.9980399e-01	
HS46	2	5	13	12	1.3637595e-07		13	12	1.3637595e-07	
HS47	3	5	20	13	1.7917613e-07		20	13	1.7917613e-07	
HS48	2	5	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS49	2	5	11	11	4.5732460e-06		11	11	4.5732460e-06	
HS50	3	5	8	8	8.4129508e-13		8	8	8.4129508e-13	
HS51	3	5	1	1	0.0000000e+00		1	1	0.0000000e+00	
HS52	3	5	2	2	5.3266416e+00		2	2	5.3266416e+00	
HS53	3	5	8	8	4.0928843e+00		3	3	4.0930243e+00	
HS54	1	6	17	17	-8.6731969e-01		2	2	-1.5396022e-01	
HS55	6	6	10	10	6.3333518e+00		7	7	6.3333365e+00	
HS56	4	7	9	7	-3.4560000e+00		9	7	-3.4560000e+00	
HS57	1	2	848	441	9.5937332e+01		144	104	9.5979714e+01	
HS59	3	2	2415	349	-6.7451077e+00		-	-	2.7925023e+01	itn
HS60	1	3	9	9	3.2568678e-02		4	4	3.2569220e-02	
HS61	2	3	46	23	-1.4364622e+02		46	23	-1.4364622e+02	
HS62	1	3	17	17	-2.6273076e+04		18	13	-2.6272951e+04	
HS63	2	3	9	9	9.6171521e+02		6	5	9.6171517e+02	
HS64	1	3	36	36	6.2998365e+03		18	18	6.2998424e+03	
HS65	1	3	18	18	9.5352703e-01		11	8	9.5352859e-01	
HS66	2	3	8	8	5.1819272e-01		5	5	5.1815604e-01	
HS67	14	3	14	14	-1.1620730e+03		7	6	-1.1621160e+03	
HS68	2	4	21	21	-9.2100763e-01		22	22	-9.2081631e-01	
HS69	2	4	14	14	-9.5671355e+02		15	10	-9.5671295e+02	
HS70	1	4	13	13	2.6908607e-01		10	10	2.6908620e-01	
HS71	2	4	13	13	1.7014014e+01		7	7	1.7014017e+01	
HS72	2	4	36	36	7.2666004e+02		31	31	7.2372906e+02	
HS73	3	4	14	14	2.9894674e+01		16	11	2.9894382e+01	
HS74	5	4	30	30	5.1264976e+03		5	5	5.1264981e+03	
HS75	5	4	40	40	5.1741987e+03		29	28	5.1743478e+03	
HS76	3	4	10	10	-4.6817534e+00		6	6	-4.6818182e+00	
HS76I	3	4	10	10	-4.6817569e+00		6	6	-4.6818182e+00	
HS77	2	5	8	7	2.4150509e-01		8	7	2.4150509e-01	
HS78	3	5	4	4	-2.9197004e+00		4	4	-2.9197004e+00	
HS79	3	5	4	4	7.8776821e-02		4	4	7.8776821e-02	

Table 5: Results on CUTEst HS problems (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS80	3	5	8	8	5.3943453e-02		5	5	5.3949705e-02	
HS81	3	5	10	10	5.3948122e-02		14	8	5.3947487e-02	
HS83	3	5	29	29	-3.0667895e+04		10	10	-3.0666798e+04	
HS84	3	5	59	28	-5.2795882e+06		87	15	-5.2803343e+06	
HS85	21	5	2	2	-1.2555560e+00		1	1	-1.2549055e+00	
HS86	10	5	13	13	-3.2348648e+01		5	5	-3.2346516e+01	
HS88	1	2	43	41	1.3467502e+00		42	40	1.3446835e+00	
HS89	1	3	41	41	1.3470174e+00		41	40	1.3445049e+00	
HS90	1	4	41	41	1.3470130e+00		40	40	1.3445390e+00	
HS91	1	5	42	41	1.3470088e+00		44	41	1.2980857e+00	
HS92	1	6	40	40	1.3443075e+00		45	40	1.3446176e+00	
HS93	2	6	18	18	1.3507108e+02		15	11	1.3507572e+02	
HS95	4	6	16	16	2.7039375e-01		96	16	1.5623261e-02	
HS96	4	6	16	16	2.8247013e-01		247	24	2.7773526e-05	
HS97	4	6	19	19	4.0771030e+00		130	26	3.5792812e+00	
HS98	4	6	18	18	4.0793737e+00		185	30	3.2554863e+00	
HS99	2	7	16	16	-8.3107989e+08		5	5	-8.3107989e+08	
HS100	4	7	15	11	6.8062994e+02		12	6	6.8062935e+02	
HS100LNP	2	7	16	13	6.8063006e+02		16	13	6.8063006e+02	
HS100MOD	4	7	11	9	6.7868025e+02		10	8	6.7867977e+02	
HS101	5	7	178	82	1.8092571e+03		41	24	1.7686136e+03	
HS102	5	7	89	78	8.9497172e+02		131	47	9.1276115e+02	
HS103	5	7	70	63	5.3676678e+02		108	37	5.4348408e+02	
HS104	5	8	10	10	3.9494996e+00		10	8	3.9511621e+00	
HS105	1	8	25	25	1.0446823e+03		31	16	1.0446106e+03	
HS106	6	8	-	-	1.4007679e+04	itn	2	2	1.4999932e+04	
HS107	6	9	36	36	5.0545034e+03		21	14	5.0543546e+03	
HS108	13	9	18	16	-8.6602494e-01		21	13	-6.7499405e-01	
HS109	10	9	117	53	5.3620172e+03		65	22	5.3621590e+03	
HS110	0	10	5	5	-4.5778475e+01		4	4	-4.5778476e+01	
HS111	3	10	15	15	-4.7762212e+01		14	13	-4.7762068e+01	
HS111LNP	3	10	12	11	-4.7762174e+01		12	11	-4.7762174e+01	
HS112	3	10	6	6	-4.7758084e+01		9	9	-4.7757612e+01	
HS113	8	10	13	13	2.4309112e+01		13	8	2.4313531e+01	
HS114	11	10	230	67	-1.7677473e+03		1273	224	-1.7687337e+03	
HS116	14	13	148	126	9.7372780e+01		253	83	9.8366643e+01	
HS117	5	15	20	20	3.2350965e+01		7	7	3.2348679e+01	
HS118	17	15	24	24	6.6482149e+02		36	13	6.6482045e+02	
HS119	8	16	18	18	2.4491043e+02		8	8	2.4489998e+02	
HS268	5	5	19	19	4.4591241e-05		5	5	4.5543347e-05	

Table 6: Results on small CUTEst nonlinearly constrained (NC) problems

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
A4X12	130	385	83	82	-3.5603317e+00		-	-	1.4707221e+02	itn
ACOPP118	344	608	19	19	1.0812142e+05		44	19	1.2964036e+05	
ACOPP14	38	68	20	20	4.5567813e+03		5	4	3.6030464e+03	
ACOPP30	72	142	40	40	5.7675601e+02		29	25	5.7685097e+02	
ACOPP57	128	274	21	21	1.8613565e+04		7	7	4.0173468e+04	
ACOPR118	344	726	15	15	1.0519096e+05		5	5	1.2725766e+05	
ACOPR14	38	82	15	15	4.2646584e+03		6	6	7.2419885e+03	
ACOPR30	72	172	53	43	5.7676734e+02		24	24	5.7684909e+02	
ACOPR57	128	331	14	14	1.8327591e+04		4	4	2.9475900e+04	
AIRPORT	84	42	26	26	4.7951904e+04		32	32	4.7952513e+04	
ALJAZZAF	500	1	45	37	4.9254967e+03		15	15	4.9255007e+03	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
ALLINITA	4	4	36	36	3.3167312e+01		-	-	3.2818714e+01	a
ALLINITC	4	1	48	43	3.0398872e+01		-	-	2.9653876e+01	a
ALSOTAME	2	1	10	10	8.2155090e-02		12	7	8.2084902e-02	
ANTWERP	27	10	187	184	3.2452406e+03		105	25	3.5018331e+04	
BATCH	48	73	198	198	2.5917950e+05		25	23	2.5918033e+05	
BRITGAS	450	360	14	14	3.7851829e-04		-	-	4.0850197e+01	itn
BT1	2	1	10	8	-9.9993566e-01		10	8	-9.9993566e-01	
BT2	3	1	11	11	3.2568210e-02		11	11	3.2568210e-02	
BT4	3	2	6	5	-4.5510551e+01		6	5	-4.5510551e+01	
BT5	3	2	6	5	9.6171517e+02		6	5	9.6171517e+02	
BT6	5	2	9	8	2.7704478e-01		9	8	2.7704478e-01	
BT7	5	3	232	33	3.0640024e+02		232	33	3.0640024e+02	
BT8	5	2	116	116	1.0000152e+00		116	116	1.0000152e+00	
BT9	4	2	14	11	-1.0000009e+00		14	11	-1.0000009e+00	
BT10	2	2	6	6	-1.0000003e+00		6	6	-1.0000003e+00	
BT11	5	3	6	6	8.2484422e-01		6	6	8.2484422e-01	
BT12	5	3	4	4	6.1881188e+00		4	4	6.1881188e+00	
BT13	5	1	23	23	1.8028825e-21		95	20	-7.4295206e-19	
BURKEHAN	1	1	38	38	5.4641693e-13	Sty	23	23	3.9998990e-13	Sty
BYRDSPHR	3	2	38	18	-4.6833085e+00		38	18	-4.6833085e+00	
C-RELOAD	342	284	421	416	-1.0061363e+00		18	16	-9.4979177e-01	
CAMSHAPE	100	203	182	182	-4.6673795e+00		298	179	-4.3118053e+00	
CANTILVR	5	1	18	18	1.3399458e+00		11	11	1.3399509e+00	
CAR2	179	146	17	17	2.6675903e+00		129	35	2.6675875e+00	
CATENA	99	32	37	16	-6.7180917e+04		37	16	-6.7180917e+04	
CATENARY	99	32	-	-	-1.4699359e+04	itn	-	-	-1.4699359e+04	itn
CATMIX	303	200	9	9	-4.7020173e-02		7	5	-4.7705197e-02	
CB2	3	3	19	19	1.9522091e+00		7	7	1.9522217e+00	
CB3	3	3	10	10	1.9999998e+00		6	6	2.0000000e+00	
CHACONN1	3	3	8	8	1.9522134e+00		6	6	1.9522245e+00	
CHACONN2	3	3	10	10	1.9999998e+00		6	6	2.0000000e+00	
CHAIN	102	51	177	35	5.0722467e+00		177	35	5.0722467e+00	
CHARDIS0	400	0	16	16	5.4013753e-13		5	5	1.2598913e-20	
CHARDIS1	400	199	7	7	8.4466491e-03		4	4	1.3951749e-03	
CLNLBEAM	303	200	0	0	3.5000000e+02		0	0	3.5000000e+02	
CONCON	15	11	20	20	-6.2307955e+03		4	4	-6.2307955e+03	
CONGIGMZ	3	5	50	50	2.7995461e+01		121	25	2.7999863e+01	
CORE1	65	59	445	445	9.1056682e+01		2012	307	9.5208409e+01	
CORE2	157	134	-	-	6.7245924e+01	itn	-	-	9.3578898e+01	itn
CORKSCRW	456	350	74	74	2.6479780e+01		80	47	2.6483620e+01	
COSHFUN	601	200	-	-	-7.4445184e-01	itn	-	-	-7.7326689e-01	itn
CRESC100	6	200	1825	401	5.6832568e-01		-	-	1.3019657e+01	ls
CRESC4	6	8	-	-	1.0031268e+00	itn	1409	175	8.7189867e-01	
CRESC50	6	100	-	-	2.8881811e+01	itn	554	106	7.8619213e-01	
CSFI1	5	4	40	29	-4.9075218e+01		49	14	-4.9075225e+01	
CSFI2	5	4	205	202	5.5017513e+01		167	43	5.5017488e+01	
DECONVC	63	1	51	51	2.5712278e-03		31	21	5.7401029e-05	
DEMBO7	16	20	45	45	1.7478165e+02		21	14	1.7502522e+02	
DEMYMALO	3	3	1746	206	-2.9999838e+00		401	54	-3.0000000e+00	
DIPIGRI	7	4	15	11	6.8062994e+02		12	6	6.8062935e+02	
DISC2	29	23	319	106	1.5624964e+00		47	19	1.5624998e+00	
DISCS	36	66	-	-	2.5876531e+01	itn	-	-	2.7571344e+01	itn
DITPERT	61	37	-	-	-1.5918009e+00	ls	38	17	-1.9616448e+00	
DIXCHLNG	10	5	19	14	2.4720679e+03		19	14	2.4720679e+03	
DIXCHLNV	100	50	31	21	9.8472685e+09	Sty	324	282	4.3778738e-18	
DNIEPER	61	24	102	102	1.8743204e+04		16	14	1.8743996e+04	
DRUGDIS	304	200	-	-	1.2167762e+01	itn	356	99	4.2373402e+00	Sty
DTOC1NA	298	196	7	7	2.3950011e-01		7	7	2.3950011e-01	
DTOC1NB	298	196	8	8	3.8293258e-01		8	8	3.8293258e-01	
DTOC1NC	298	196	4	4	1.7218831e+00		4	4	1.7218831e+00	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
DTOC1ND	298	196	4	4	2.3208724e+00		4	4	2.3208724e+00	
DTOC2	298	196	30	19	4.8563170e-01		30	19	4.8563170e-01	
DTOC4	299	198	3	3	2.9474240e+00		3	3	2.9474240e+00	
DTOC5	199	99	3	3	1.5321748e+00		3	3	1.5321748e+00	
DTOC6	201	100	8	8	7.2773649e+02		8	8	7.2773649e+02	
EG3	101	200	38	38	2.0465123e-08		8	8	3.4201270e-13	
EIGENA2	110	55	4	4	2.6533791e-19		4	4	2.6533791e-19	
EIGENACO	110	55	5	5	1.3892452e-13		5	5	1.3892452e-13	
EIGENB2	110	55	42	42	4.4728954e-01		42	42	4.4728954e-01	
EIGENBCO	110	55	77	47	2.2367032e-01		77	47	2.2367032e-01	
EIGENC2	462	231	12	12	2.0718757e-12		12	12	2.0718757e-12	
EIGENCCO	462	231	89	36	4.4590217e-13		89	36	4.4590217e-13	
EIGMAXA	11	11	26	26	-3.0692717e-01	Sty	22	22	-5.3179272e-01	Sty
EIGMAXB	11	11	24	24	-2.6679428e-01	Sty	20	20	-5.0008296e-01	Sty
EIGMAXC	22	22	24	24	-2.6679434e-01	Sty	22	22	-5.3179272e-01	Sty
EIGMINA	11	11	35	35	-1.0001000e+00	Sty	21	21	-9.9997472e-01	Sty
EIGMINB	11	11	24	24	-2.6679791e-01	Sty	22	22	-5.3179272e-01	Sty
EIGMINC	22	22	24	24	-2.6679434e-01	Sty	22	22	-5.3179272e-01	Sty
ELATTAR	7	102	-	-	6.8675060e+02	itn	-	-	4.3902394e+01	itn
ELEC	300	100	141	122	4.4483436e+03		141	122	4.4483436e+03	
ERRINBAR	18	9	-	-	6.7228217e+01	itn	-	-	5.4884837e+01	itn
FEEDLOC	90	259	62	62	2.1407920e-03		12	9	1.4386759e-08	
FLETCHER	4	4	14	14	1.9519132e+01		56	18	1.9525370e+01	
FLT	2	2	6	6	0.0000000e+00		6	6	0.0000000e+00	
GASOIL	1303	1298	21	17	5.2366392e-03		19	10	5.2366493e-03	
GIGOMEZ1	3	3	1937	227	-3.0000000e+00		346	53	-3.0000000e+00	
GIGOMEZ2	3	3	17	17	1.9522051e+00		7	7	1.9522211e+00	
GIGOMEZ3	3	3	10	10	1.9999999e+00		5	5	1.9999846e+00	
GILBERT	100	1	26	19	4.4479900e+01		24	17	4.4480036e+01	
GLIDER	664	608	-	-	-2.1436841e+02	itn	-	-	-2.2011876e+02	itn
GPP	250	498	24	24	1.4400469e+04		9	9	1.4400734e+04	
GROUPING	100	125	39	36	1.5560410e+00	Sty	34	32	1.5560409e+00	Sty
HAIFAM	99	150	21	19	-4.5001200e+01		389	65	-4.5000709e+01	
HAIFAS	13	9	10	10	-4.5004071e-01		12	10	-4.5000000e-01	itn
HALDMADS	6	42	31	22	6.9134141e-05		16	12	5.3896031e-05	
HANGING	300	180	16	14	-6.2017570e+02		22	13	-6.2017626e+02	
HET-Z	2	202	15	15	9.9998784e-01		7	7	9.999975e-01	
HIMMELBK	24	14	-	-	2.4546719e-01		43	20	8.9334500e-02	
HIMMELP2	2	1	1188	201	-6.2021636e+01		475	81	-6.2053936e+01	
HIMMELP3	2	2	82	26	-5.7846098e+01		169	31	-5.8031680e+01	
HIMMELP4	2	3	79	32	-5.8518730e+01		160	30	-5.8428818e+01	
HIMMELP5	2	3	210	81	-5.8621197e+01		2859	287	-5.8484316e+01	
HIMMELP6	2	5	366	89	-5.8524352e+01		2963	334	-5.8320490e+01	
HS6	2	1	42	12	0.0000000e+00		42	12	0.0000000e+00	
HS7	2	1	32	11	-1.7320554e+00		32	11	-1.7320554e+00	
HS10	2	1	9	9	-1.0000336e+00		8	8	-1.0000009e+00	
HS11	2	1	7	7	-8.4985589e+00		5	5	-8.4984641e+00	
HS12	2	1	14	11	-3.0000000e+01		202	27	-3.0000000e+01	
HS13	2	1	35	35	8.8892362e-01		37	37	8.9753859e-01	
HS14	2	2	7	7	1.3934645e+00		4	4	1.3934292e+00	
HS15	2	2	29	29	3.0648861e+02		9	8	3.6038040e+02	
HS16	2	2	11	11	2.5000103e-01		6	5	2.4996008e-01	
HS17	2	2	10	10	1.0000267e+00		5	5	1.0000831e+00	
HS18	2	2	29	21	4.9984800e+00		50	20	4.9992119e+00	
HS19	2	2	33	33	-6.9618499e+03		10	10	-6.9619157e+03	
HS20	2	3	24	24	3.8194331e+01		14	11	3.8198601e+01	
HS22	2	2	7	7	1.0000000e+00		3	3	1.0001651e+00	
HS23	2	5	17	17	2.0000253e+00		58	22	9.4730587e+00	
HS26	3	1	12	12	2.4660757e-08		12	12	2.4660757e-08	
HS27	3	1	65	12	3.9999999e-02		65	12	3.9999999e-02	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS29	3	1	16	15	-2.2627417e+01		38	13	-2.2627417e+01	
HS30	3	1	9	9	1.0000504e+00		5	5	1.0000001e+00	
HS31	3	1	10	10	6.0000108e+00		5	5	5.9999998e+00	
HS32	3	2	11	11	1.0009733e+00		5	5	9.9999983e-01	
HS33	3	2	14	14	-4.5857388e+00		21	10	-4.5857864e+00	
HS34	3	2	12	12	-8.3402578e-01		22	10	-8.3403247e-01	
HS39	4	2	14	11	-1.0000009e+00		14	11	-1.0000009e+00	
HS40	4	3	3	3	-2.5000084e-01		3	3	-2.5000084e-01	
HS42	4	2	4	4	1.3857845e+01		4	4	1.3857845e+01	
HS43	4	3	12	12	-4.4000081e+01		7	6	-4.4000000e+01	
HS46	5	2	13	12	1.3637595e-07		13	12	1.3637595e-07	
HS47	5	3	20	13	1.7917613e-07		20	13	1.7917613e-07	
HS56	7	4	9	7	-3.4560000e+00		9	7	-3.4560000e+00	
HS57	2	1	848	441	9.5937332e+01		144	104	9.5979714e+01	
HS59	2	3	2415	349	-6.7451077e+00		-	-	2.7925023e+01	itn
HS60	3	1	9	9	3.2568678e-02		4	4	3.2569220e-02	
HS61	3	2	46	23	-1.4364622e+02		46	23	-1.4364622e+02	
HS63	3	2	9	9	9.6171521e+02		6	5	9.6171517e+02	
HS64	3	1	36	36	6.2998365e+03		18	18	6.2998424e+03	
HS65	3	1	18	18	9.5352703e-01		11	8	9.5352859e-01	
HS66	3	2	8	8	5.1819272e-01		5	5	5.1815604e-01	
HS67	3	14	14	14	-1.1620730e+03		7	6	-1.1621160e+03	
HS68	4	2	21	21	-9.2100763e-01		22	22	-9.2081631e-01	
HS69	4	2	14	14	-9.5671355e+02		15	10	-9.5671295e+02	
HS70	4	1	13	13	2.6908607e-01		10	10	2.6908620e-01	
HS71	4	2	13	13	1.7014014e+01		7	7	1.7014017e+01	
HS72	4	2	36	36	7.2666004e+02		31	31	7.2372906e+02	
HS73	4	3	14	14	2.9894674e+01		16	11	2.9894382e+01	
HS74	4	5	30	30	5.1264976e+03		5	5	5.1264981e+03	
HS75	4	5	40	40	5.1741987e+03		29	28	5.1743478e+03	
HS77	5	2	8	7	2.4150509e-01		8	7	2.4150509e-01	
HS78	5	3	4	4	-2.9197004e+00		4	4	-2.9197004e+00	
HS79	5	3	4	4	7.8776821e-02		4	4	7.8776821e-02	
HS80	5	3	8	8	5.3943453e-02		5	5	5.3949705e-02	
HS81	5	3	10	10	5.3948122e-02		14	8	5.3947487e-02	
HS83	5	3	29	29	-3.0667895e+04		10	10	-3.0666798e+04	
HS84	5	3	59	28	-5.2795882e+06		87	15	-5.2803343e+06	
HS85	5	21	2	2	-1.2555560e+00		1	1	-1.2549055e+00	
HS88	2	1	43	41	1.3467502e+00		42	40	1.3446835e+00	
HS89	3	1	41	41	1.3470174e+00		41	40	1.3445049e+00	
HS90	4	1	41	41	1.3470130e+00		40	40	1.3445390e+00	
HS91	5	1	42	41	1.3470088e+00		44	41	1.2980857e+00	
HS92	6	1	40	40	1.3443075e+00		45	40	1.3446176e+00	
HS93	6	2	18	18	1.3507108e+02		15	11	1.3507572e+02	
HS95	6	4	16	16	2.7039375e-01		96	16	1.5623261e-02	
HS96	6	4	16	16	2.8247013e-01		247	24	2.7773526e-05	
HS97	6	4	19	19	4.0771030e+00		130	26	3.5792812e+00	
HS98	6	4	18	18	4.0793737e+00		185	30	3.2554863e+00	
HS99	7	2	16	16	-8.3107989e+08		5	5	-8.3107989e+08	
HS100	7	4	15	11	6.8062994e+02		12	6	6.8062935e+02	
HS100LNP	7	2	16	13	6.8063006e+02		16	13	6.8063006e+02	
HS100MOD	7	4	11	9	6.7868025e+02		10	8	6.7867977e+02	
HS101	7	5	178	82	1.8092571e+03		41	24	1.7686136e+03	
HS102	7	5	89	78	8.9497172e+02		131	47	9.1276115e+02	
HS103	7	5	70	63	5.3676678e+02		108	37	5.4348408e+02	
HS104	8	5	10	10	3.9494996e+00		10	8	3.9511621e+00	
HS106	8	6	-	-	1.4007679e+04	itn	2	2	1.4999932e+04	
HS107	9	6	36	36	5.0545034e+03		21	14	5.0543546e+03	
HS108	9	13	18	16	-8.6602494e-01		21	13	-6.7499405e-01	
HS109	9	10	117	53	5.3620172e+03		65	22	5.3621590e+03	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
HS111	10	3	15	15	-4.7762212e+01		14	13	-4.7762068e+01	
HS111LNP	10	3	12	11	-4.7762174e+01		12	11	-4.7762174e+01	
HS113	10	8	13	13	2.4309112e+01		13	8	2.4313531e+01	
HS114	10	11	230	67	-1.7677473e+03		1273	224	-1.7687337e+03	
HS116	13	14	148	126	9.7372780e+01		253	83	9.8366643e+01	
HS117	15	5	20	20	3.2350965e+01		7	7	3.2348679e+01	
HVYCRASH	404	300	-	-	-1.6019849e-01	itn	130	69	-2.1850001e-01	
JANNSON3	6	3	9	9	4.5576111e+00		5	5	4.5575853e+00	
JANNSON4	3	2	11	11	1.0608378e+00		6	6	1.0608797e+00	
JUNKTURN	510	350	56	38	9.3773840e-05	Sty	56	38	9.3773840e-05	Sty
KISSING	127	903	88	87	1.0000054e+00		572	65	1.0001152e+00	
KISSING2	100	625	-	-	1.7868439e+02	itn	315	109	6.6540586e+00	
KIWCRES	3	2	-	-	-2.1666571e+00	itn	-	-	-2.1666293e+00	itn
LAKES	90	78	18	18	3.5055201e+05		26	23	3.5065854e+05	
LAUNCH	25	28	10	10	1.1934353e+01		5	4	1.1380631e+01	
LCH	300	1	16	16	-4.2581443e+00		16	16	-4.2581443e+00	
LEAKNET	156	153	52	52	7.9749110e+00		38	31	8.0007919e+00	
LEWISPOL	6	9	9	9	1.1267533e+00		2	2	1.1267400e+00	
LIPPERT1	221	500	533	116	-3.6054918e-02		3	3	-1.0336450e-02	
LIPPERT2	221	500	192	87	2.7735457e+01		370	76	2.9254719e+01	
LOOTMA	3	2	20	20	1.4142378e+00		12	9	1.4142136e+00	
LUBRIF	151	100	474	442	-6.7619027e-03	Sty	208	56	-6.6148906e-03	Sty
LUBRIFC	151	100	228	223	-5.8360843e-03	Sty	349	47	-7.2058184e-03	Sty
LUKVLE1	100	98	5	5	6.2324572e+00		5	5	6.2324572e+00	
LUKVLE2	100	49	-	-	-2.9472085e+64	No mo	-	-	-4.5000000e+62	ls
LUKVLE3	100	2	8	8	2.7586585e+01		8	8	2.7586585e+01	
LUKVLE4	100	49	141	90	-2.5468570e+03		141	90	-2.5468570e+03	
LUKVLE5	102	96	19	13	2.6392837e+00		19	13	2.6392837e+00	
LUKVLE6	99	49	15	15	6.0376510e+03		15	15	6.0376510e+03	
LUKVLE7	100	4	10	9	-2.5944423e+01		10	9	-2.5944423e+01	
LUKVLE8	100	98	40	33	8.2521928e+03		40	33	8.2521928e+03	
LUKVLE9	100	6	32	22	1.0239618e+01		32	22	1.0239618e+01	
LUKVLE10	100	98	17	13	3.4924515e+01		17	13	3.4924515e+01	
LUKVLE11	98	64	325	71	1.8486438e+02	itn	325	71	1.8486438e+02	
LUKVLE12	97	72	134	96	5.6495024e+09	Sty	-	-	5.6495024e+09	itn
LUKVLE13	98	64	17	11	9.8673682e+02		17	11	9.8673682e+02	
LUKVLE14	98	64	29	26	2.6023446e+06		29	26	2.6023446e+06	
LUKVLE15	97	72	57	33	1.2139866e-05		57	33	1.2139866e-05	
LUKVLE16	97	72	57	42	1.5022402e+02		57	42	1.5022402e+02	
LUKVLE17	97	72	43	29	2.8437716e+02		43	29	2.8437716e+02	
LUKVLE18	97	72	41	22	1.0414647e+02		41	22	1.0414647e+02	
LUKVLI1	100	98	428	230	5.7152552e+00		420	217	5.7152775e+00	
LUKVLI2	100	49	47	47	-1.4197468e+15	Unb	-	-	-4.5000000e+62	ls
LUKVLI3	100	2	14	14	1.1577586e+01		10	10	1.1577557e+01	
LUKVLI4	100	49	-	-	-5.2535898e+13		-	-	-2.1832907e+13	Unb
LUKVLI5	102	96	-	-	1.3257772e+00	itn	40	24	5.2681037e-01	
LUKVLI6	99	49	75	75	6.0376522e+03		12	12	6.0376224e+03	
LUKVLI7	100	4	13	13	-2.9305099e+01		6	6	-2.9277794e+01	
LUKVLI8	100	98	375	375	1.0282898e+04		70	55	7.9640759e+03	
LUKVLI9	100	6	217	51	9.9903268e+00		105	31	9.9904641e+00	
LUKVLI10	100	98	22	21	3.4924592e+01		15	12	3.4924404e+01	
LUKVLI11	98	64	18	17	1.6232055e-05		17	14	3.1975974e-06	
LUKVLI12	97	72	25	25	2.4822408e-08		15	12	7.8109824e-06	
LUKVLI13	98	64	35	35	1.2162436e+00		13	12	1.2161615e+00	
LUKVLI14	98	64	43	43	1.5660734e+04		10	9	1.5664794e+04	
LUKVLI15	97	72	-	-	2.2110244e-03	itn	38	25	8.7943526e-05	
LUKVLI16	97	72	28	28	2.3909421e+01		18	14	2.3908754e+01	
LUKVLI17	97	72	21	20	6.8256601e+00		13	10	6.8233448e+00	
LUKVLI18	97	72	12	12	2.1351973e-04		11	11	1.5556886e-05	
MADSEN	3	6	96	51	6.1642003e-01		52	22	6.1643228e-01	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
MADSSCHJ	201	398	2144	390	-4.9922113e+03		-	-	2.8638311e+02	itn
MAKELA1	3	2	14	11	-1.4141935e+00		69	11	-1.4142158e+00	
MAKELA2	3	3	14	14	7.1985244e+00		10	6	7.1999999e+00	
MAKELA3	21	20	31	28	-9.7053208e-09		607	83	-2.3471252e-06	
MANNE	300	200	11	11	-9.6955129e-01		12	8	-9.7457255e-01	
MARATOS	2	1	79	9	-1.0000216e+00		79	9	-1.0000216e+00	
MARINE	1415	1392	-	-	1.3955907e+09	itn	130	31	1.9752215e+07	
MATRIX2	6	2	9	9	1.4060000e-04		8	8	1.3836272e-04	
MCONCON	15	11	20	20	-6.2307955e+03		4	4	-6.2307955e+03	
MESH	41	48	65	65	-1.0764893e+15	Unb	32	32	-1.7922256e+15	Unb
METHANOL	1505	1497	19	16	9.0224849e-03		34	13	9.0224145e-03	
MIFFLIN1	3	2	7	7	-1.0000000e+00		4	4	-1.0000029e+00	
MIFFLIN2	3	2	50	21	-1.0000002e+00		-	-	-1.0955986e+00	itn
MINC44	311	262	-	-	-1.1702113e-06	itn	107	53	2.6805760e-03	
MINMAXBD	5	20	61	35	1.1570565e+02		91	24	1.1570631e+02	
MINMAXRB	3	4	33	16	6.5712685e-10		17	9	4.1907088e-08	
MINPERM	51	36	31	31	3.8397925e-02		6	6	3.8399603e-02	
MISTAKE	9	13	12	12	-1.0000334e+00		92	19	-1.0000607e+00	
MRIBASIS	36	55	13	13	1.8217886e+01		16	10	1.8217900e+01	
MSS1	90	73	32	32	-8.9748579e+00		32	32	-8.9748579e+00	
MWRIGHT	5	3	7	6	2.4978784e+01		7	6	2.4978784e+01	
NET1	48	57	145	145	9.3943862e+05		20	17	1.0655633e+06	
NET2	144	160	330	330	1.1831409e+06		81	29	1.1867423e+06	
NET3	464	521	-	-	2.1012290e+06	itn	754	95	5.9772957e+06	
NGONE	50	323	48	44	-6.3598619e-01		43	29	-6.3328381e-01	
OET1	3	202	16	16	5.3818400e-01		294	85	5.3819574e-01	
OET2	3	202	20	20	8.7133212e-02		95	63	8.7118342e-02	
OET3	4	202	5	5	7.6341326e-02		9	9	4.5013148e-03	
OET4	4	202	47	47	4.2670088e-03		26	18	4.2628392e-03	
OET5	5	202	2270	283	2.5782570e-03	itn	291	57	2.6210905e-03	
OET6	5	202	64	64	8.7152077e-02		378	161	2.0640121e-03	
OET7	7	202	262	262	8.7151398e-02		-	-	6.3245463e-02	itn
OPTCDEG2	302	200	34	34	2.3727282e+02		61	34	2.3727643e+02	
OPTCDEG3	302	200	18	18	4.7614487e+01		35	32	4.7614668e+01	
OPTCNTRL	32	20	27	27	5.4999357e+02		11	11	5.5000077e+02	
OPTCTRL3	302	200	27	21	5.0475836e+03		27	21	5.0475836e+03	
OPTCTRL6	302	200	27	21	5.0475836e+03		27	21	5.0475836e+03	
OPTMASS	70	55	425	215	-1.8954014e-01		406	92	-1.8954175e-01	
OPTPRLOC	30	30	297	118	-1.6418094e+01		910	125	-1.6410912e+01	
ORBIT2	268	207	-	-	1.0000002e+02	itn	-	-	1.0000002e+02	itn
ORTHRDM2	203	100	6	5	7.7757247e+00		6	5	7.7757247e+00	
ORTHRS2	203	100	57	24	7.8991112e+02		57	24	7.8991112e+02	
ORTHREGA	133	64	6	6	4.1468406e+02		6	6	4.1468406e+02	
ORTHREGB	27	6	3	3	1.2079880e-12		3	3	1.2079880e-12	
ORTHREGC	105	50	9	8	1.9756397e+00		9	8	1.9756397e+00	
ORTHREGD	103	50	-	-	2.5386122e+02	itn	-	-	2.5386122e+02	itn
ORTHREGE	36	20	13	12	5.9595554e+00		16	9	5.9595323e+00	
ORTHREGF	305	100	16	15	5.3104845e+00		16	14	4.5159639e+00	
ORTHRGDM	203	100	-	-	4.9588193e+02		-	-	4.9588193e+02	itn
ORTHRGDS	203	100	19	13	3.0507909e+01		19	13	3.0507909e+01	
PINENE	1105	1095	36	35	1.8784394e+01		39	32	1.2625083e+01	
POLAK1	3	2	9	9	2.7182818e+00		8	8	2.7182818e+00	
POLAK2	11	2	8	8	5.4603247e+01		5	5	5.4603591e+01	
POLAK3	12	10	46	46	5.9329673e+00		21	17	5.9330034e+00	
POLAK4	3	3	8	8	2.4838822e-06		3	3	5.9023138e-06	
POLAK5	3	2	14	14	5.0000110e+01		5	5	5.0000000e+01	
POLAK6	5	4	40	37	-4.4000081e+01		-	-	-2.9571623e+01	itn
POLYGON	50	324	-	-	-7.7131673e-01	itn	65	27	-7.2687176e-01	
PRODPL0	60	29	21	21	5.8744489e+01		51	30	5.8784782e+01	
PRODPL1	60	29	18	18	3.5798181e+01		186	34	3.5746579e+01	

Table 6: Results on “small” CUTEst NCs (continued)

Name	n	m	pdb				pdproj			
			fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
READING1	202	100	216	74	-1.6049124e-01		1470	196	-1.6046463e-01	
READING3	202	101	114	49	-1.5261822e-01		193	57	-1.5261654e-01	
READING4	101	100	51	37	-2.7989235e-01		322	48	-2.7987421e-01	
READING5	101	100	10	10	2.0878655e-08		6	6	-5.0301048e-08	
READING6	102	50	17	17	-1.4465700e+02		10	10	-1.4465968e+02	
READING9	402	200	6	6	-2.1870566e-02		4	4	-1.5577262e-02	
RK23	17	11	8	8	8.3382135e-02		6	6	8.3336846e-02	
ROBOT	14	2	32	32	6.5932988e+00		24	24	6.5932942e+00	
ROBOTARM	562	402	-	-	1.1910459e+02	itn	353	110	9.1473269e+00	
ROCKET	607	502	-	-	-1.0079205e+00	itn	-	-	-9.9990000e-01	itn
ROSEMMX	5	4	16	13	-4.4000164e+01		21	9	-4.4000002e+01	
ROSEPETAL	100	200	140	140	-9.2424617e+02		20	14	-9.2424086e+02	
ROSEPETAL2	101	201	-	-	-1.1147674e+03	itn	20	15	-9.2424094e+02	
S316-322	2	1	7	5	3.3430861e+02		7	5	3.3430861e+02	
SAWPATH	583	774	298	245	2.7282384e+02	Sty	518	116	2.7173044e+02	Sty
SINROSNB	100	99	-	-	1.3780363e+03	itn	180	111	1.4147621e+00	
SMMPSF	720	263	-	-	3.7971699e+05	itn	-	-	1.5551349e+06	itn
SNAKE	2	2	-	-	-6.6709465e+02	itn	-	-	2.7633601e+06	itn
SPIN2OP	102	100	24	10	3.0774612e-12		24	10	3.0774612e-12	
SPINOP	497	495	3089	400	1.4477938e+01		3089	400	1.4477938e+01	
SPIRAL	3	2	113	80	-1.0251013e-07		133	74	-6.7745436e-09	
SREADIN3	202	101	114	49	-1.5261823e-01		193	57	-1.5261655e-01	
SSEBNLN	194	96	277	277	1.6170603e+07		32	28	1.8072535e+07	
SSNLBEAM	303	200	0	0	3.5000000e+02		0	0	3.5000000e+02	
STEERING	506	400	11	11	5.5458143e-01		9	6	5.5459475e-01	
SVANBERG	100	100	19	19	1.6619719e+02		81	22	1.6619717e+02	
SWOPF	83	92	62	36	6.7844193e-02		26	13	6.7859905e-02	
SYNTHESE1	6	6	10	10	7.5951112e-01		4	4	7.5927465e-01	
SYNTHESE2	11	14	13	13	-5.5382654e-01		10	10	-5.5459217e-01	
SYNTHESE3	17	23	22	22	1.5083455e+01		10	10	1.5082035e+01	
TENBARS1	18	9	21	21	2.3025477e+03		-	-	3.1242049e+03	itn
TENBARS2	18	8	22	22	2.3025484e+03		-	-	3.0904855e+03	itn
TENBARS3	18	8	21	21	2.2471287e+03		56	21	2.2471291e+03	
TENBARS4	18	9	154	57	3.6849316e+02		2212	267	3.6849316e+02	
TF11	3	101	17	17	5.3346517e+00		15	9	5.3346873e+00	
TRAINF	808	402	163	163	3.2267918e+00		25	14	3.1015471e+00	
TRAINH	408	202	-	-	1.2520778e+01	itn	53	30	1.2313698e+01	
TRIMLOSS	142	75	241	143	9.0600495e+00		239	55	9.0600767e+00	
TRO11X3	150	61	-	-	1.6209039e+03	itn	-	-	1.7875684e+02	itn
TRO21X5	540	201	-	-	1.5216966e+02	itn	-	-	3.0100320e+01	itn
TRO3X3	30	13	13	13	8.9992989e+00		9	7	9.0000993e+00	
TRO4X4	63	25	14	14	8.9993845e+00		31	23	9.0002930e+00	
TRO5X5	108	41	16	16	8.9996863e+00		94	52	9.0004455e+00	
TRO6X2	45	21	122	122	1.2253995e+03		-	-	-7.1612700e+05	itn
TRUSPYR1	11	4	19	19	1.1228743e+01		55	13	1.1228745e+01	
TRUSPYR2	11	11	19	19	1.1228766e+01		23	10	1.1228714e+01	
TRY-B	2	1	16	16	2.9178223e-12		13	11	8.9311655e-14	
TWIRISM1	343	313	-	-	-9.3766580e-01	itn	218	65	-1.0003771e+00	
TWOBARS	2	2	8	8	1.5085448e+00		4	4	1.5086375e+00	
UBH5	110	70	19	19	1.1471040e+00		17	17	1.1473497e+00	
WACHBIEG	3	2	47	47	1.0001072e+00		10	10	1.0000029e+00	
WOMFLET	3	3	11	11	6.0499455e+00		9	6	6.0499983e+00	
YORKNET	312	256	35	35	1.3922895e+04		-	-	2.6368631e+04	itn
ZAMB2-8	138	48	43	43	-1.5292430e-01		84	30	-1.5292777e-01	
ZAMB2-9	138	48	66	57	-3.5457515e-01		25	18	-3.5433377e-01	
ZAMB2-10	270	96	162	93	-1.5823715e+00		63	31	-1.5821815e+00	
ZAMB2-11	270	96	68	68	-1.1160859e+00		63	22	-1.1160686e+00	
ZECEVIC3	2	2	11	11	9.7308023e+01		6	6	9.7309450e+01	
ZECEVIC4	2	2	12	12	7.5575124e+00		5	5	7.5575268e+00	
ZIGZAG	304	250	85	85	3.3786941e+01		155	76	3.3783509e+01	

Table 6: Results on “small” CUTEst NCs (continued)

			pdb				pdproj			
Name	n	m	fe	Itn	Obj	Exit	fe	Itn	Obj	Exit
ZY2	3	2	14	14	2.0000841e+00		20	9	2.0001304e+00	

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