

HIMMELBLAU

Mk function: @(x)hessf(x)

x0 = [1.00 ; -0.50]

.. #	0: R=	NaN	f(x)=	143.31	x(1)=	1	x(2)=	-0.5	step=	NaN	crate=	NaN	gradf =	54.337
Gr #	1: R=	0.52249	f(x)=	70.401	x(1)=	4.3438	x(2)=	0.09375	step=	0.0625	crate=	NaN	gradf =	133.88
NF #	2: R=	0.046057	f(x)=	16.16	x(1)=	3.6036	x(2)=	0.3042	step=	1	crate=	NaN	gradf =	26.406
NF #	3: R=	0.084881	f(x)=	13.331	x(1)=	3.4067	x(2)=	0.063925	step=	1	crate=	0.40364	gradf =	1.9946
NF #	4: R=	0.11236	f(x)=	13.312	x(1)=	3.3853	x(2)=	0.074024	step=	1	crate=	0.076263	gradf =	0.018068
NF #	5: R=	0.11468	f(x)=	13.312	x(1)=	3.3852	x(2)=	0.073852	step=	1	crate=	0.010023	gradf =	1.2754e-06
NF #	6: R=	0.1147	f(x)=	13.312	x(1)=	3.3852	x(2)=	0.073852	step=	1	crate=	5.5949e-05	gradf =	3.5527e-15

Mk function: @(x)hessf(x)

Hessian approximation at last iterate (rank = 2, condition = 6.901072e+00, eigenvalues = (-14.1352, 97.5479)):

95.8066336808564	13.8360242537791
13.8360242537791	-12.3939340637051

Hessian (exact) at last iterate (rank = 2, condition = 6.901072e+00, eigenvalues = (-14.1352, 97.5479)):

95.8066336808564	13.8360242537791
13.8360242537791	-12.3939340637051

x0 = [1.00 ; -0.50]
x = [3.38515418 ; 0.07385188]
f(x) = 13.311926
#it = 6 #f = 23 #gradf = 7 #hessf = 6

Mk function: @(x)diag(diag(hessf(x)))

x0 = [1.00 ; -0.50]

.. #	0: R=	NaN	f(x)=	143.31	x(1)=	1	x(2)=	-0.5	step=	NaN	crate=	NaN	gradf =	54.337
Gr #	1: R=	0.59375	f(x)=	70.401	x(1)=	4.3438	x(2)=	0.09375	step=	0.0625	crate=	NaN	gradf =	133.88
NF #	2: R=	0.046103	f(x)=	15.827	x(1)=	3.6238	x(2)=	1.8463	step=	1	crate=	NaN	gradf =	58.309
NF #	3: R=	0.2391	f(x)=	2.1958	x(1)=	3.1543	x(2)=	1.5675	step=	1	crate=	0.28819	gradf =	8.5391
NF #	4: R=	0.19245	f(x)=	0.59101	x(1)=	3.1095	x(2)=	2.044	step=	1	crate=	0.87648	gradf =	10.17
NF #	5: R=	0.44489	f(x)=	0.065424	x(1)=	2.9946	x(2)=	1.9407	step=	1	crate=	0.32272	gradf =	2.5738
NF #	6: R=	0.42488	f(x)=	0.012199	x(1)=	3.0161	x(2)=	2.0061	step=	1	crate=	0.44529	gradf =	1.4232
NF #	7: R=	0.45697	f(x)=	0.00184	x(1)=	2.9985	x(2)=	1.9907	step=	1	crate=	0.34001	gradf =	0.45581
NF #	8: R=	0.45422	f(x)=	0.00030064	x(1)=	3.0025	x(2)=	2.001	step=	1	crate=	0.47286	gradf =	0.22257
NF #	9: R=	0.45906	f(x)=	4.7402e-05	x(1)=	2.9997	x(2)=	1.9985	step=	1	crate=	0.33472	gradf =	0.073724
NF #	10: R=	0.45863	f(x)=	7.5694e-06	x(1)=	3.0004	x(2)=	2.0002	step=	1	crate=	0.47631	gradf =	0.035294
NF #	11: R=	0.4594	f(x)=	1.2018e-06	x(1)=	3	x(2)=	1.9998	step=	1	crate=	0.33356	gradf =	0.011753
NF #	12: R=	0.45933	f(x)=	1.912e-07	x(1)=	3.0001	x(2)=	2	step=	1	crate=	0.47685	gradf =	0.0056089
NF #	13: R=	0.45945	f(x)=	3.0391e-08	x(1)=	3	x(2)=	2	step=	1	crate=	0.33337	gradf =	0.0018694
NF #	14: R=	0.45944	f(x)=	4.8323e-09	x(1)=	3	x(2)=	2	step=	1	crate=	0.47693	gradf =	0.00089166
NF #	15: R=	0.45946	f(x)=	7.6822e-10	x(1)=	3	x(2)=	2	step=	1	crate=	0.33334	gradf =	0.00029722
NF #	16: R=	0.45946	f(x)=	1.2214e-10	x(1)=	3	x(2)=	2	step=	1	crate=	0.47694	gradf =	0.00014176
NF #	17: R=	0.45946	f(x)=	1.9417e-11	x(1)=	3	x(2)=	2	step=	1	crate=	0.33334	gradf =	4.7253e-05
NF #	18: R=	0.45946	f(x)=	3.087e-12	x(1)=	3	x(2)=	2	step=	1	crate=	0.47695	gradf =	2.2537e-05
NF #	19: R=	0.45946	f(x)=	4.9078e-13	x(1)=	3	x(2)=	2	step=	1	crate=	0.33333	gradf =	7.5123e-06
NF #	20: R=	0.45946	f(x)=	7.8026e-14	x(1)=	3	x(2)=	2	step=	1	crate=	0.47695	gradf =	3.583e-06
NF #	21: R=	0.45946	f(x)=	1.2405e-14	x(1)=	3	x(2)=	2	step=	1	crate=	0.33333	gradf =	1.1943e-06
NF #	22: R=	0.45946	f(x)=	1.9721e-15	x(1)=	3	x(2)=	2	step=	1	crate=	0.47695	gradf =	5.6963e-07

Mk function: @(x)diag(diag(hessf(x)))

Hessian approximation at last iterate (rank = 2, condition = 2.176471e+00, eigenvalues = (34, 74)):

74.0000004763511	0
0	34.0000001432567

Hessian (exact) at last iterate (rank = 2, condition = 3.199764e+00, eigenvalues = (25.7157, 82.2843)):

74.0000004763511	20.0000000356987
20.0000000356987	34.0000001432567

x0 = [1.00 ; -0.50]
x = [3.00000001 ; 2.00000000]
f(x) = 1.9721331e-15
#it = 22 #f = 71 #gradf = 23 #hessf = 22

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Mk function: @(x)hessf(x0)
x0 = [1.00 ; -0.50]
.. # 0: R=      NaN f(x)=    143.31 x(1)=      1 x(2)=    -0.5 step=      NaN crate=      NaN ||gradf|| =    54.337
Gr # 1: R=    0.52249 f(x)=     70.401 x(1)=    4.3438 x(2)=     0.09375 step=     0.0625 crate=      NaN ||gradf|| =    133.88
Gr # 2: R=    0.52249 f(x)=     58.351 x(1)=    2.2649 x(2)=    -0.13955 step=    0.015625 crate=      NaN ||gradf|| =     64.563
Gr # 3: R=    0.52249 f(x)=     14.084 x(1)=     3.263 x(2)=    0.0071234 step=    0.015625 crate=    0.48225 ||gradf|| =     12.011
Gr # 4: R=    0.52249 f(x)=     13.452 x(1)=     3.4503 x(2)=    0.019587 step=    0.015625 crate=    0.18604 ||gradf|| =     5.8674
Gr # 5: R=    0.52249 f(x)=     13.324 x(1)=     3.3619 x(2)=   -0.0049429 step=    0.015625 crate=    0.4885 ||gradf|| =     3.3399
Gr # 6: R=    0.52249 f(x)=     13.266 x(1)=     3.4131 x(2)=    -0.01537 step=    0.015625 crate=    0.56924 ||gradf|| =     2.0974
Gr # 7: R=    0.52249 f(x)=     13.247 x(1)=     3.3669 x(2)=   -0.061868 step=     0.03125 crate=     1.256 ||gradf|| =     3.8503
Gr # 8: R=    0.52249 f(x)=     13.143 x(1)=     3.4226 x(2)=   -0.084465 step=    0.015625 crate=    0.91785 ||gradf|| =     2.8783
Gr # 9: R=    0.52249 f(x)=     13.078 x(1)=     3.3299 x(2)=    -0.2386 step=     0.0625 crate=     2.9902 ||gradf|| =     9.753
Gr # 10: R=    0.52249 f(x)=     12.466 x(1)=     3.4741 x(2)=    -0.28778 step=    0.015625 crate=    0.84712 ||gradf|| =     6.8087
Gr # 11: R=    0.52249 f(x)=     11.878 x(1)=     3.3498 x(2)=   -0.46049 step=     0.03125 crate=     1.3962 ||gradf|| =    11.656
Gr # 12: R=    0.52249 f(x)=     11.728 x(1)=     3.6648 x(2)=   -0.64345 step=     0.03125 crate=     1.7119 ||gradf|| =    23.186
Gr # 13: R=    0.52249 f(x)=     9.2972 x(1)=     3.3467 x(2)=   -0.81678 step=    0.015625 crate=    0.99458 ||gradf|| =    16.583
Gr # 14: R=    0.52249 f(x)=     7.014 x(1)=     3.5689 x(2)=   -0.94996 step=    0.015625 crate=     0.7152 ||gradf|| =    12.779
Gr # 15: R=    0.52249 f(x)=     4.5646 x(1)=     3.3757 x(2)=   -1.2994 step=     0.03125 crate=     1.5413 ||gradf|| =    18.074
Gr # 16: R=    0.52249 f(x)=     2.3037 x(1)=     3.6269 x(2)=   -1.4284 step=    0.015625 crate=     0.70716 ||gradf|| =    12.007
Gr # 17: R=    0.52249 f(x)=     2.1153 x(1)=     3.381 x(2)=   -1.7118 step=     0.03125 crate=     1.3287 ||gradf|| =    18.824
Gr # 18: R=    0.52249 f(x)=     0.63598 x(1)=     3.6731 x(2)=   -1.7454 step=    0.015625 crate=     0.78386 ||gradf|| =    10.966
Gr # 19: R=    0.52249 f(x)=     0.28967 x(1)=     3.5105 x(2)=   -1.7993 step=    0.015625 crate=     0.58254 ||gradf|| =     7.2342
Gr # 20: R=    0.52249 f(x)=     0.10529 x(1)=     3.6227 x(2)=   -1.8128 step=    0.015625 crate=     0.65971 ||gradf|| =     4.5174
Gr # 21: R=    0.52249 f(x)=     0.045105 x(1)=     3.5551 x(2)=   -1.8328 step=    0.015625 crate=     0.62445 ||gradf|| =     2.9448
Gr # 22: R=    0.52249 f(x)=     0.017601 x(1)=     3.6009 x(2)=   -1.8366 step=    0.015625 crate=     0.65188 ||gradf|| =     1.8767
Gr # 23: R=    0.52249 f(x)=     0.0073991 x(1)=     3.5725 x(2)=   -1.8436 step=    0.015625 crate=     0.6373 ||gradf|| =     1.2176
Gr # 24: R=    0.52249 f(x)=     0.0029927 x(1)=     3.5915 x(2)=   -1.8444 step=    0.015625 crate=     0.64878 ||gradf|| =     0.78257
Gr # 25: R=    0.52249 f(x)=     0.0012519 x(1)=     3.5795 x(2)=   -1.8469 step=    0.015625 crate=     0.64273 ||gradf|| =     0.50682
Gr # 26: R=    0.52249 f(x)=     0.00051553 x(1)=     3.5874 x(2)=   -1.8469 step=    0.015625 crate=     0.64764 ||gradf|| =     0.32697
Gr # 27: R=    0.52249 f(x)=     0.0002155 x(1)=     3.5824 x(2)=   -1.8478 step=    0.015625 crate=     0.64515 ||gradf|| =     0.21164
Gr # 28: R=    0.52249 f(x)=     8.9519e-05 x(1)=     3.5857 x(2)=   -1.8477 step=    0.015625 crate=     0.64725 ||gradf|| =     0.13677
Gr # 29: R=    0.52249 f(x)=     3.7434e-05 x(1)=     3.5836 x(2)=   -1.848 step=    0.015625 crate=     0.64623 ||gradf|| =     0.088507
Gr # 30: R=    0.52249 f(x)=     1.5616e-05 x(1)=     3.585 x(2)=   -1.848 step=    0.015625 crate=     0.64714 ||gradf|| =     0.057241
Gr # 31: R=    0.52249 f(x)=     6.5334e-06 x(1)=     3.5841 x(2)=   -1.8481 step=    0.015625 crate=     0.64673 ||gradf|| =     0.037042
Gr # 32: R=    0.52249 f(x)=     2.731e-06 x(1)=     3.5847 x(2)=   -1.8481 step=    0.015625 crate=     0.64712 ||gradf|| =     0.023965
Gr # 33: R=    0.52249 f(x)=     1.1431e-06 x(1)=     3.5843 x(2)=   -1.8481 step=    0.015625 crate=     0.64696 ||gradf|| =     0.015508
Gr # 34: R=    0.52249 f(x)=     4.7828e-07 x(1)=     3.5845 x(2)=   -1.8481 step=    0.015625 crate=     0.64713 ||gradf|| =     0.010035
Gr # 35: R=    0.52249 f(x)=     2.0024e-07 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64707 ||gradf|| =     0.0064941
Gr # 36: R=    0.52249 f(x)=     8.3825e-08 x(1)=     3.5845 x(2)=   -1.8481 step=    0.015625 crate=     0.64715 ||gradf|| =     0.0042024
Gr # 37: R=    0.52249 f(x)=     3.5101e-08 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64712 ||gradf|| =     0.0027196
Gr # 38: R=    0.52249 f(x)=     1.4698e-08 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64715 ||gradf|| =     0.00176
Gr # 39: R=    0.52249 f(x)=     6.155e-09 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64715 ||gradf|| =     0.001139
Gr # 40: R=    0.52249 f(x)=     2.5776e-09 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64716 ||gradf|| =     0.00073711
Gr # 41: R=    0.52249 f(x)=     1.0795e-09 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64716 ||gradf|| =     0.00047703
Gr # 42: R=    0.52249 f(x)=     4.5209e-10 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     0.00030872
Gr # 43: R=    0.52249 f(x)=     1.8934e-10 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64716 ||gradf|| =     0.00019979
Gr # 44: R=    0.52249 f(x)=     7.93e-11 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     0.0001293
Gr # 45: R=    0.52249 f(x)=     3.3212e-11 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     8.3679e-05
Gr # 46: R=    0.52249 f(x)=     1.391e-11 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     5.4154e-05
Gr # 47: R=    0.52249 f(x)=     5.8259e-12 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     3.5047e-05
Gr # 48: R=    0.52249 f(x)=     2.44e-12 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     2.2681e-05
Gr # 49: R=    0.52249 f(x)=     1.022e-12 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     1.4679e-05
Gr # 50: R=    0.52249 f(x)=     4.2802e-13 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     9.4996e-06
Gr # 51: R=    0.52249 f(x)=     1.7927e-13 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     6.1479e-06
Gr # 52: R=    0.52249 f(x)=     7.5083e-14 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     3.9787e-06
Gr # 53: R=    0.52249 f(x)=     3.1447e-14 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     2.5749e-06
Gr # 54: R=    0.52249 f(x)=     1.3171e-14 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     1.6664e-06
Gr # 55: R=    0.52249 f(x)=     5.5163e-15 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     1.0784e-06
Gr # 56: R=    0.52249 f(x)=     2.3104e-15 x(1)=     3.5844 x(2)=   -1.8481 step=    0.015625 crate=     0.64717 ||gradf|| =     6.9794e-07

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Mk function: @(x)hessf(x0)
Hessian approximation at last iterate (rank = 2, condition = 1.727380e+00, eigenvalues = (-32.3007, -18.6993)):
   -32      2
    2     -19

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Hessian (exact) at last iterate (rank = 2, condition = 3.674326e+00, eigenvalues = (28.6907, 105.419)):
   104.785012785247      6.94520728230533
    6.94520728230533     29.3245732762862

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x0 = [1.00 ; -0.50]
x = [3.58442835 ; -1.84812653]
f(x) = 2.3103946e-15
#it = 56 #f = 496 #gradf = 57 #hessf = 56

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