

Some Relative Equilibria of N Equal Masses

N = 4,5,6,7

Relative equilibria of N equal masses (normalized to 1) were found by repeatedly applying a combination steepest descent-Newton's method iteration with randomly chosen initial conditions. These are all the relative equilibria which the method turned up after a reasonable amount of searching. Next to each picture, the coordinates of the N masses are shown together with their distances from the origin (the center of mass). Below that, the potential energy is given and then the index and nullity of the Hessian of the potential at that central configuration (these are for the restriction of the potential to the set of planar configurations, even though the coordinates are given in three-dimensions). No guarantees are offered that these are all the relative equilibria; however, the relative equilibria listed here satisfy the Morse inequalities.

Moehel

(0.213210, 0.000000 , 0.000000) 0.213210
(-0.213210, 0.000000 , 0.000000) 0.213210
(-0.674197, 0.000000 , 0.000000) 0.674197
(0.674197, 0.000000 , 0.000000) 0.674197

Potential = 9.679064

Index = 2 Nullity = 1

(0.000000, -0.000000 , 0.000000) 0.000000
(0.577350, 0.000000 , -0.000000) 0.577350
(-0.288675, -0.500000 , -0.000000) 0.577350
(-0.288675, 0.500000 , 0.000000) 0.577350

Potential = 8.196152

Index = 2 Nullity = 1

(-0.300909, -0.487772 , -0.000000) 0.573121
(0.016328, 0.000000 , 0.000000) 0.016328
(0.585490, 0.000000 , -0.000000) 0.585490
(-0.300909, 0.487772 , -0.000000) 0.573121

Potential = 8.196081

Index = 1 Nullity = 1

(-0.500000, -0.000000 , -0.000000) 0.500000
(-0.000000, -0.500000 , 0.000000) 0.500000
(0.000000, 0.500000 , 0.000000) 0.500000
(0.500000, 0.000000 , 0.000000) 0.500000

Potential = 7.656854

Index = 0 Nullity = 1

(-0.000000, 0.000000, 0.000000) 0.000000
(-0.301658, 0.000000, 0.000000) 0.301658
(-0.639533, 0.000000, 0.000000) 0.639533
(0.639533, 0.000000, 0.000000) 0.639533
(0.301658, 0.000000, 0.000000) 0.301658

Potential = 20.240950

Index = 3 Nullity = 1

(0.202386, 0.015610, 0.000000) 0.202987
(0.592848, -0.000000, 0.000000) 0.592848
(-0.504856, 0.310788, 0.000000) 0.592848
(-0.126214, -0.445787, 0.000000) 0.463310
(-0.164164, 0.119389, 0.000000) 0.202987

Potential = 17.123997

Index = 2 Nullity = 1

(0.524355, 0.000000, 0.000000) 0.524355
(-0.191771, -0.488029, 0.000000) 0.524355
(0.067470, -0.099004, 0.000000) 0.119809
(0.050226, 0.464060, 0.000000) 0.466770
(-0.450280, 0.122973, 0.000000) 0.466770

Potential = 15.683971

Index = 1 Nullity = 1

(-0.000000 , -0.500000 , 0.000000) 0.500000
(-0.500000 , 0.000000 , 0.000000) 0.500000
(-0.000000 , 0.500000 , 0.000000) 0.500000
(0.500000 , -0.000000 , 0.000000) 0.500000
(0.000000 , -0.000000 , 0.000000) 0.000000

Potential = 15.656854

Index = 0 Nullity = 1

(0.138197 , -0.425325 , 0.000000) 0.447214
(0.138197 , 0.425325 , 0.000000) 0.447214
(-0.361803 , -0.262866 , 0.000000) 0.447214
(0.447214 , -0.000000 , 0.000000) 0.447214
(-0.361803 , 0.262866 , 0.000000) 0.447214

Potential = 15.388418

Index = 0 Nullity = 1

(0.343277, 0.000000 , 0.000000) 0.343277
(-0.111771, 0.000000 , 0.000000) 0.111771
(-0.608003, 0.000000 , 0.000000) 0.608003
(0.608003, 0.000000 , 0.000000) 0.608003
(0.111771, 0.000000 , 0.000000) 0.111771
(-0.343277, 0.000000 , 0.000000) 0.343277

Potential = 36.252989

Index = 4 Nullity = 1

(0.280927, 0.007602 , 0.000000) 0.281030
(-0.526869, 0.238382 , 0.000000) 0.578288
(-0.087400, -0.405190 , 0.000000) 0.414509
(-0.252815, 0.122731 , 0.000000) 0.281030
(0.578288, 0.000000 , 0.000000) 0.578288
(0.007868, 0.036475 , 0.000000) 0.037314

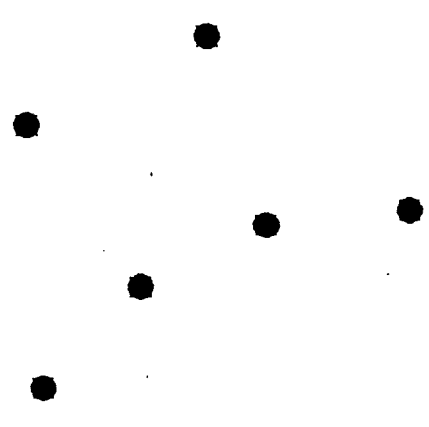
Potential = 30.997838

Index = 3 Nullity = 1

(-0.268236, -0.464599 , 0.000000) 0.536473
(0.536473, 0.000000 , 0.000000) 0.536473
(-0.106689, -0.184791 , 0.000000) 0.213379
(0.213379, -0.000000 , 0.000000) 0.213379
(-0.268236, 0.464599 , 0.000000) 0.536473
(-0.106689, 0.184791 , 0.000000) 0.213379

Potential = 29.597244

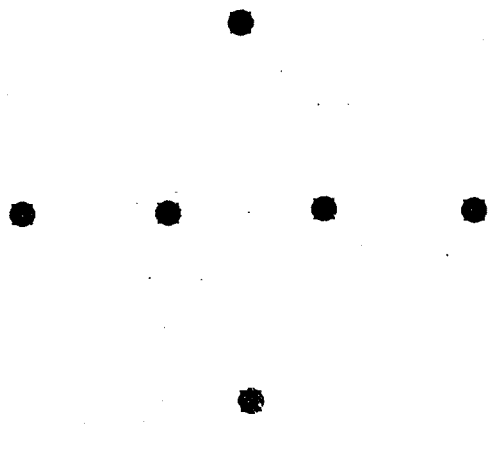
Index = 3 Nullity = 1



(0.196250, -0.035481 , 0.000000) 0.199431
(-0.097091, -0.174201 , 0.000000) 0.199431
(-0.338175, -0.411976 , 0.000000) 0.532997
(-0.364555, 0.207943 , 0.000000) 0.419691
(0.070574, 0.413715 , 0.000000) 0.419691
(0.532997, -0.000000 , 0.000000) 0.532997

Potential = 28.116155

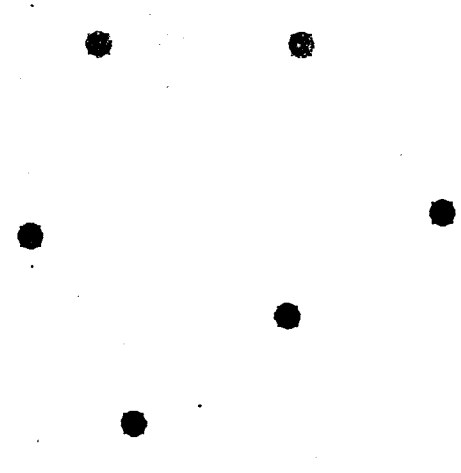
Index = 2 Nullity = 1



(0.000000, -0.440773 , 0.000000) 0.440773
(-0.177489, -0.000000 , 0.000000) 0.177489
(-0.000000, 0.440773 , 0.000000) 0.440773
(0.177489, 0.000000 , 0.000000) 0.177489
(0.523657, 0.000000 , 0.000000) 0.523657
(-0.523657, -0.000000 , 0.000000) 0.523657

Potential = 27.798331

Index = 2 Nullity = 1



(-0.390072, -0.042683 , 0.000000) 0.392400
(0.144009, -0.213404 , 0.000000) 0.257449
(0.473380, 0.000000 , 0.000000) 0.473380
(-0.177146, -0.438985 , 0.000000) 0.473380
(-0.235723, 0.349315 , 0.000000) 0.421410
(0.185553, 0.345758 , 0.000000) 0.392400

Potential = 26.886819

Index = 1 Nullity = 1

(-0.204124, -0.353553 , 0.000000) 0.408248
(0.408248, -0.000000 , 0.000000) 0.408248
(0.204124, -0.353553 , 0.000000) 0.408248
(-0.204124, 0.353553 , 0.000000) 0.408248
(-0.408248, -0.000000 , 0.000000) 0.408248
(0.204124, 0.353553 , 0.000000) 0.408248

Potential = 26.856454

Index = 1 Nullity = 1

(-0.211562, -0.366436 , 0.000000) 0.423124
(0.196405, -0.340183 , 0.000000) 0.392810
(-0.392810, -0.000000 , 0.000000) 0.392810
(0.423124, 0.000000 , 0.000000) 0.423124
(0.196405, 0.340183 , 0.000000) 0.392810
(-0.211562, 0.366436 , 0.000000) 0.423124


Potential = 26.856364

Index = 0 Nullity = 1

(0.447214, 0.000000 , 0.000000) 0.447214
(-0.361803, -0.262866 , 0.000000) 0.447214
(0.138197, -0.425325 , 0.000000) 0.447214
(0.000000, -0.000000 , 0.000000) 0.000000
(0.138197, 0.425325 , 0.000000) 0.447214
(-0.361803, 0.262866 , 0.000000) 0.447214

Potential = 26.568758


Index = 0 Nullity = 1



(-0.176766, 0.000000, 0.000000) 0.176766
(0.363575, 0.000000, 0.000000) 0.363575
(0.580144, 0.000000, 0.000000) 0.580144
(0.176766, 0.000000, 0.000000) 0.176766
(-0.000000, 0.000000, 0.000000) 0.000000
(-0.363575, 0.000000, 0.000000) 0.363575
(-0.580144, 0.000000, 0.000000) 0.580144

Potential = 58.690576

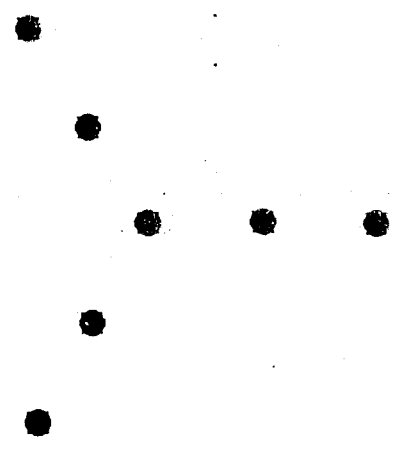
Index = 5 Nullity = 1



(-0.063145, -0.368835, 0.000000) 0.374201
(-0.097550, 0.051190, 0.000000) 0.110166
(0.560641, -0.000000, 0.000000) 0.560641
(0.109023, 0.015825, 0.000000) 0.110166
(-0.528712, 0.186500, 0.000000) 0.560641
(-0.301993, 0.111052, 0.000000) 0.321764
(0.321736, 0.004268, 0.000000) 0.321764

Potential = 50.747141

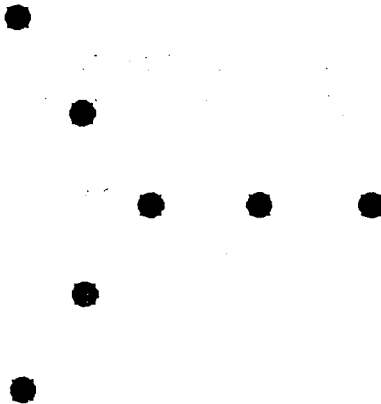
Index = 4 Nullity = 1



(0.516972, -0.000000, 0.000000) 0.516972
(-0.128523, -0.222609, 0.000000) 0.257047
(0.000000, 0.000000, 0.000000) 0.000000
(-0.258486, -0.447711, 0.000000) 0.516972
(-0.128523, 0.222609, 0.000000) 0.257047
(0.257047, 0.000000, 0.000000) 0.257047
(-0.258486, 0.447711, 0.000000) 0.516972

Potential = 47.891777

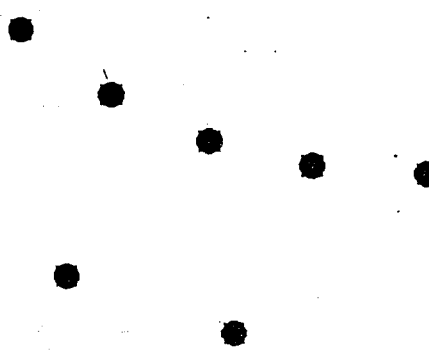
Index = 5 Nullity = 1



(0.268069, -0.000000, 0.000000) 0.268069
(-0.132521, -0.213403, 0.000000) 0.251203
(-0.273733, -0.433555, 0.000000) 0.512737
(0.019308, -0.000000, 0.000000) 0.019308
(0.525131, -0.000000, 0.000000) 0.525131
(-0.273733, 0.433555, 0.000000) 0.512737
(-0.132521, 0.213403, 0.000000) 0.251203

Potential = 47.890259

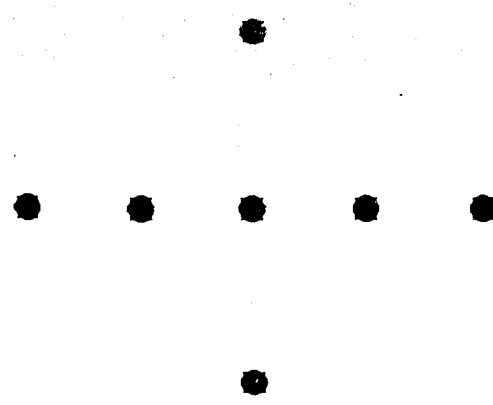
Index = 4 Nullity = 1



(0.265230, 0.016785, 0.000000) 0.265761
(-0.193768, 0.181887, 0.000000) 0.265761
(0.080732, -0.373363, 0.000000) 0.381991
(-0.300061, -0.236391, 0.000000) 0.381991
(0.529508, -0.000000, 0.000000) 0.529508
(0.026543, 0.073793, 0.000000) 0.078421
(-0.408185, 0.337289, 0.000000) 0.529508

Potential = 45.891126

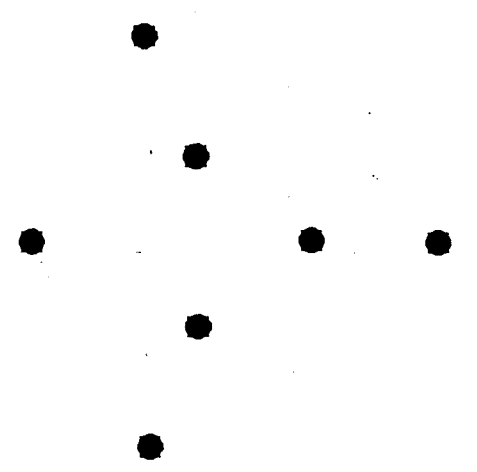
Index = 3 Nullity = 1



(-0.000000, -0.000000, 0.000000) 0.000000
(-0.256044, -0.000000, 0.000000) 0.256044
(-0.000000, -0.399499, 0.000000) 0.399499
(0.524253, -0.000000, 0.000000) 0.524253
(0.000000, 0.399499, 0.000000) 0.399499
(-0.524253, 0.000000, 0.000000) 0.524253
(0.256044, -0.000000, 0.000000) 0.256044

Potential = 45.308905

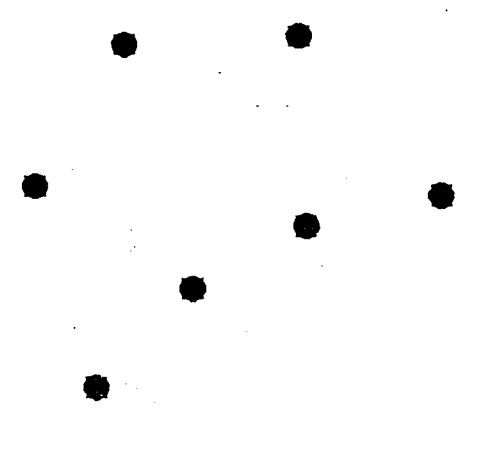
Index = 3 Nullity = 1



(-0.397247, 0.000000, 0.000000) 0.397247
(-0.138438, -0.461811, 0.000000) 0.482114
(-0.026409, -0.189694, 0.000000) 0.191524
(0.222503, 0.000000, 0.000000) 0.222503
(-0.026409, 0.189694, 0.000000) 0.191524
(0.504437, 0.000000, 0.000000) 0.504437
(-0.138438, 0.461811, 0.000000) 0.482114

Potential = 44.266676

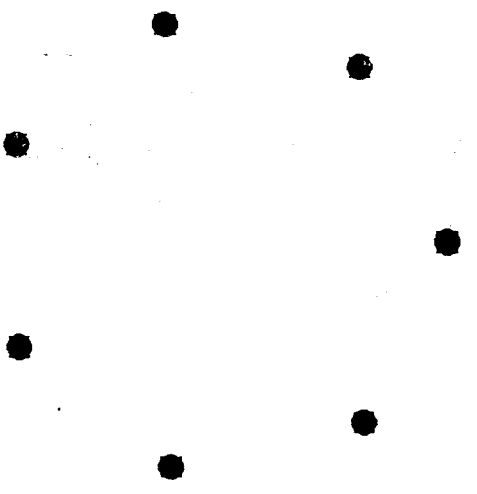
Index = 3 Nullity = 1



(0.182306, 0.340511, 0.000000) 0.386243
(-0.254111, -0.415718, 0.000000) 0.487230
(-0.183056, 0.326440, 0.000000) 0.374263
(0.487230, -0.000000, 0.000000) 0.487230
(0.196361, -0.069493, 0.000000) 0.208295
(-0.043117, -0.203784, 0.000000) 0.208295
(-0.385613, 0.022043, 0.000000) 0.386243

Potential = 43.298268

Index = 2 Nullity = 1



(0.377964, 0.000000, 0.000000) 0.377964
(0.235657, -0.295505, 0.000000) 0.377964
(0.235657, 0.295505, 0.000000) 0.377964
(-0.084105, -0.368488, 0.000000) 0.377964
(-0.084105, 0.368488, 0.000000) 0.377964
(-0.340534, -0.163993, 0.000000) 0.377964
(-0.340534, 0.163993, 0.000000) 0.377964

Potential = 42.684843

Index = 2 Nullity = 1

(0.060865, -0.422402, 0.000000) 0.426765
(0.472775, 0.000000, 0.000000) 0.472775
(0.163050, -0.037753, 0.000000) 0.167363
(-0.145758, -0.082250, 0.000000) 0.167363
(-0.453542, -0.133476, 0.000000) 0.472775
(-0.248704, 0.309121, 0.000000) 0.396749
(0.151314, 0.366761, 0.000000) 0.396749

Potential = 42.601951

Index = 2 Nullity = 1

(-0.249899, -0.136378, 0.000000) 0.284690
(0.179677, 0.220828, 0.000000) 0.284690
(-0.082970, -0.447197, 0.000000) 0.454829
(0.454829, 0.000000, 0.000000) 0.454829
(0.174885, -0.210316, 0.000000) 0.273528
(-0.383753, 0.165550, 0.000000) 0.417940
(-0.092768, 0.407514, 0.000000) 0.417940

Potential = 42.496185

Index = 2 Nullity = 1

(0.153918, -0.188803, 0.000000) 0.243592
(-0.325683, -0.172915, 0.000000) 0.368740
(0.153918, 0.188803, 0.000000) 0.243592
(-0.325683, 0.172915, 0.000000) 0.368740
(-0.057873, -0.442580, 0.000000) 0.446348
(0.459276, 0.000000, 0.000000) 0.459276
(-0.057873, 0.442580, 0.000000) 0.446348

Potential = 42.459990

Index = 1 Nullity = 1

(0.190098, 0.329203, 0.000000) 0.380147
(-0.178666, 0.058368, 0.000000) 0.187958
(0.139862, -0.125567, 0.000000) 0.187958
(-0.382198, -0.212885, 0.000000) 0.437488
(0.006669, -0.437437, 0.000000) 0.437488
(-0.224118, 0.388319, 0.000000) 0.448353
(0.448353, 0.000000, 0.000000) 0.448353

Potential = 42.328597

Index = 1 Nullity = 1

(0.408248, 0.000000, 0.000000) 0.408248
(0.000000, 0.000000, 0.000000) 0.000000
(0.204124, 0.353553, 0.000000) 0.408248
(0.204124, -0.353553, 0.000000) 0.408248
(-0.204124, -0.353553, 0.000000) 0.408248
(-0.408248, -0.000000, 0.000000) 0.408248
(-0.204124, 0.353553, 0.000000) 0.408248

Potential = 41.553393

Index = 0 Nullity = 1

Addendum: $N=8$

Note the occurrence of two types of relative equilibria lacking symmetry.



(-0.217008, 0.000000, 0.000000) 0.217008
(-0.071368, 0.000000, 0.000000) 0.071368
(0.555604, 0.000000, 0.000000) 0.555604
(-0.555604, 0.000000, 0.000000) 0.555604
(0.217008, 0.000000, 0.000000) 0.217008
(0.071368, 0.000000, 0.000000) 0.071368
(0.372986, 0.000000, 0.000000) 0.372986
(-0.372986, 0.000000, 0.000000) 0.372986

Potential = 88.483509

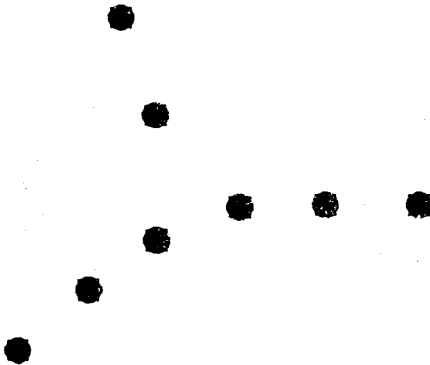
Index = 6 Nullity = 1



(0.343387, 0.002636, 0.000000) 0.343397
(-0.329043, 0.098246, 0.000000) 0.343397
(0.169817, 0.008397, 0.000000) 0.170025
(-0.048278, -0.339539, 0.000000) 0.342954
(-0.520794, 0.151155, 0.000000) 0.542286
(0.003371, 0.023706, 0.000000) 0.023945
(-0.160747, 0.055399, 0.000000) 0.170025
(0.542286, 0.000000, 0.000000) 0.542286

Potential = 77.321497

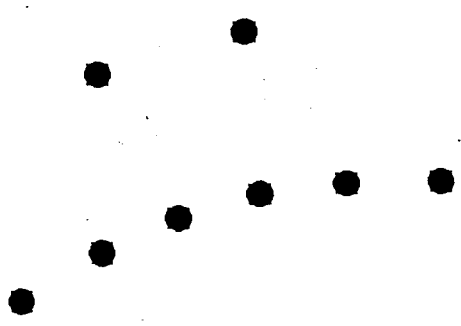
Index = 5 Nullity = 1



(-0.075094, -0.205184, 0.000000) 0.218494
(-0.230967, 0.199219, 0.000000) 0.305015
(-0.077703, 0.081833, 0.000000) 0.112847
(0.304999, 0.003066, 0.000000) 0.305015
(0.517492, 0.000000, 0.000000) 0.517492
(-0.155659, -0.425320, 0.000000) 0.452909
(-0.395239, 0.334043, 0.000000) 0.517492
(0.112170, 0.012343, 0.000000) 0.112847

Potential = 72.086401

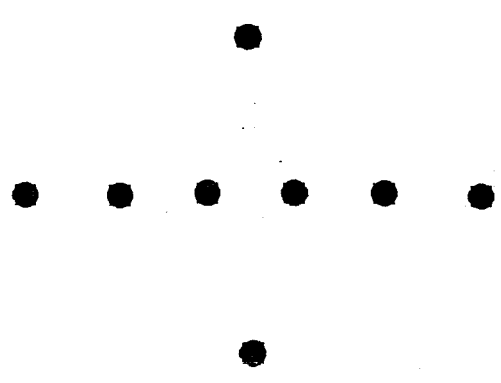
Index = 5 Nullity = 1



(0.109643, -0.034804 , 0.000000) 0.115034
 (-0.249830, -0.172254 , 0.000000) 0.303458
 (0.303319, -0.009161 , 0.000000) 0.303458
 (0.081407, 0.343039 , 0.000000) 0.352566
 (0.519978, -0.000000 , 0.000000) 0.519978
 (-0.073223, -0.088721 , 0.000000) 0.115034
 (-0.436803, -0.282101 , 0.000000) 0.519978
 (-0.254492, 0.244001 , 0.000000) 0.352566

Potential = 69.984399

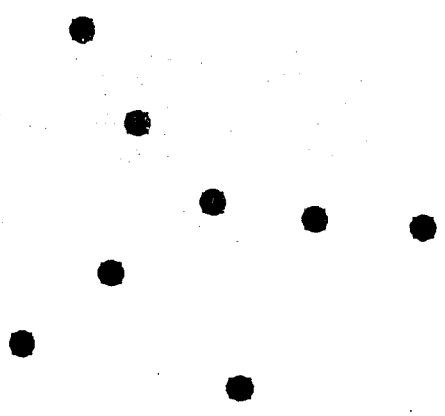
Index = 4 Nullity = 1



(0.517478, -0.000000 , 0.000000) 0.517478
 (0.099574, 0.000000 , 0.000000) 0.099574
 (-0.298692, -0.000000 , 0.000000) 0.298692
 (0.000000, -0.364807 , 0.000000) 0.364807
 (-0.517478, -0.000000 , 0.000000) 0.517478
 (-0.000000, 0.364807 , 0.000000) 0.364807
 (-0.099574, 0.000000 , 0.000000) 0.099574
 (0.298692, 0.000000 , 0.000000) 0.298692

Potential = 69.096263

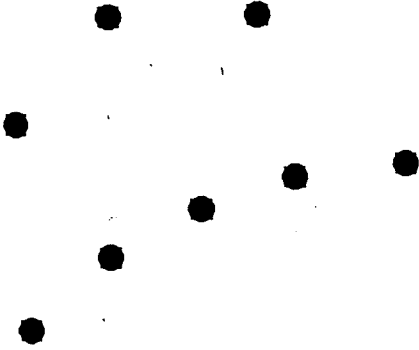
Index = 4 Nullity = 1



(-0.115624, 0.224918 , 0.000000) 0.252897
 (0.492998, -0.000000 , 0.000000) 0.492998
 (-0.374112, -0.257918 , 0.000000) 0.454402
 (-0.175591, -0.106193 , 0.000000) 0.205205
 (0.045162, 0.053306 , 0.000000) 0.069865
 (0.261281, 0.012200 , 0.000000) 0.261565
 (0.100531, -0.352532 , 0.000000) 0.366586
 (-0.234645, 0.426221 , 0.000000) 0.486541

Potential = 66.673405

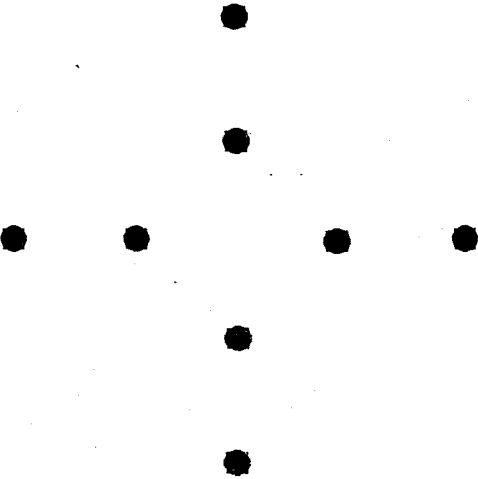
Index = 4 Nullity = 1



(0.047838, -0.105117, 0.000000) 0.115491
(-0.142750, -0.209069, 0.000000) 0.253155
(0.251408, -0.029690, 0.000000) 0.253155
(-0.352725, 0.080008, 0.000000) 0.361685
(-0.321080, -0.368581, 0.000000) 0.488819
(0.488819, -0.000000, 0.000000) 0.488819
(-0.142870, 0.313933, 0.000000) 0.344914
(0.171359, 0.318516, 0.000000) 0.361685

Potential = 65.555466

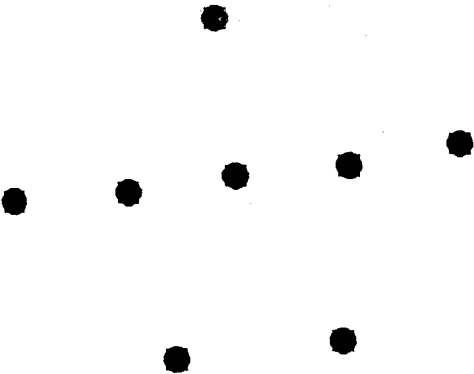
Index = 3 Nullity = 1



(-0.456882, 0.000000, 0.000000) 0.456882
(-0.203124, 0.000000, 0.000000) 0.203124
(0.203124, -0.000000, 0.000000) 0.203124
(0.000000, 0.203124, 0.000000) 0.203124
(0.000000, -0.203124, 0.000000) 0.203124
(-0.000000, -0.456882, 0.000000) 0.456882
(0.000000, 0.456882, 0.000000) 0.456882
(0.456882, 0.000000, 0.000000) 0.456882

Potential = 65.050852

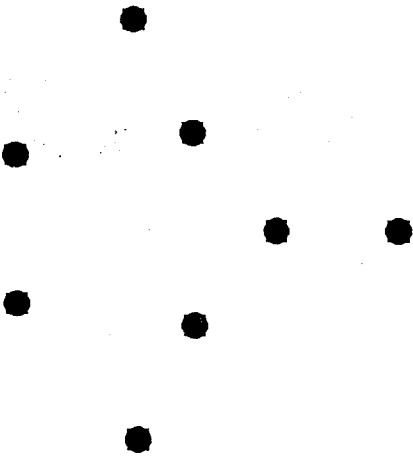
Index = 4 Nullity = 1



(-0.226369, -0.070267, 0.000000) 0.237024
(0.006443, -0.051812, 0.000000) 0.052211
(-0.213797, 0.298529, 0.000000) 0.367191
(0.236684, -0.012686, 0.000000) 0.237024
(-0.466268, -0.117783, 0.000000) 0.480914
(0.480914, 0.000000, 0.000000) 0.480914
(0.048221, -0.387780, 0.000000) 0.390767
(0.134171, 0.341800, 0.000000) 0.367191

Potential = 64.329815

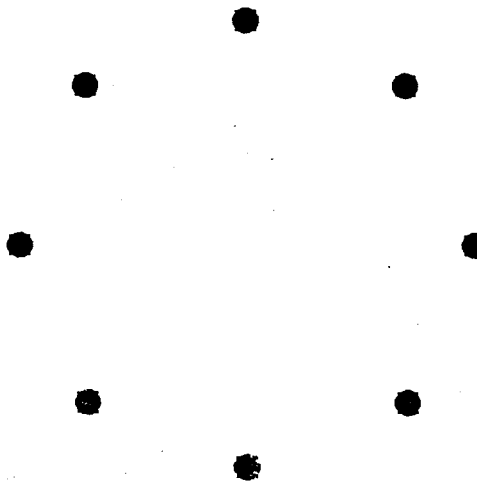
Index = 3 Nullity = 1



(-0.069271 , 0.440233 , 0.000000) 0.445650
(0.045633 , -0.198606 , 0.000000) 0.203781
(0.469575 , -0.000000 , 0.000000) 0.469575
(-0.069271 , -0.440233 , 0.000000) 0.445650
(-0.318751 , -0.157675 , 0.000000) 0.355617
(0.045633 , 0.198606 , 0.000000) 0.203781
(-0.318751 , 0.157675 , 0.000000) 0.355617
(0.215204 , -0.000000 , 0.000000) 0.215204

Potential = 63.784515

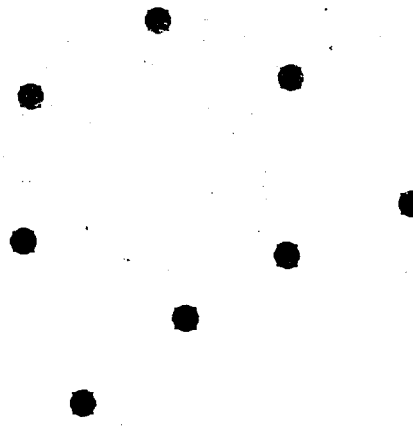
Index = 3 Nullity = 1



(0.353553 , -0.000000 , 0.000000) 0.353553
(0.250000 , -0.250000 , 0.000000) 0.353553
(-0.250000 , 0.250000 , 0.000000) 0.353553
(0.000000 , 0.353553 , 0.000000) 0.353553
(-0.353553 , -0.000000 , 0.000000) 0.353553
(-0.250000 , -0.250000 , 0.000000) 0.353553
(-0.000000 , -0.353553 , 0.000000) 0.353553
(0.250000 , 0.250000 , 0.000000) 0.353553

Potential = 63.466869

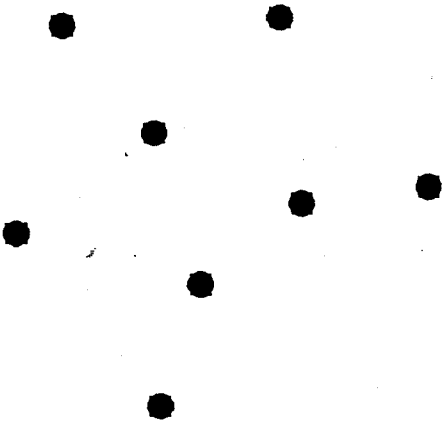
Index = 3 Nullity = 1



(0.216331 , 0.248208 , 0.000000) 0.329251
(0.453185 , 0.000000 , 0.000000) 0.453185
(0.204096 , -0.104611 , 0.000000) 0.229344
(-0.205519 , -0.403904 , 0.000000) 0.453185
(0.000678 , -0.229343 , 0.000000) 0.229344
(-0.048578 , 0.362296 , 0.000000) 0.365539
(-0.319323 , -0.080244 , 0.000000) 0.329251
(-0.300869 , 0.207597 , 0.000000) 0.365539

Potential = 63.401537

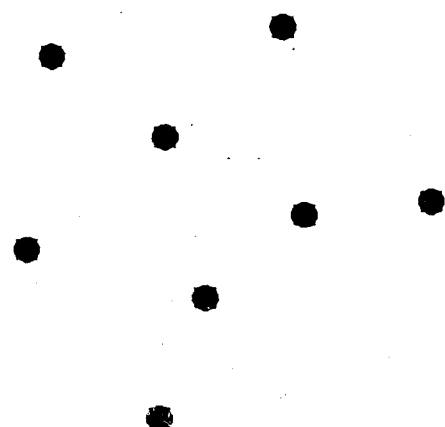
Index = 3 Nullity = 1



(-0.271994, -0.328646 , 0.000000) 0.426602
(0.458377, 0.000000 , 0.000000) 0.458377
(0.164354, -0.346754 , 0.000000) 0.383733
(-0.090362, -0.109182 , 0.000000) 0.141725
(0.201153, 0.033752 , 0.000000) 0.203965
(-0.085705, 0.450294 , 0.000000) 0.458377
(-0.004453, 0.203916 , 0.000000) 0.203965
(-0.371370, 0.096621 , 0.000000) 0.383733

Potential = 63.181566

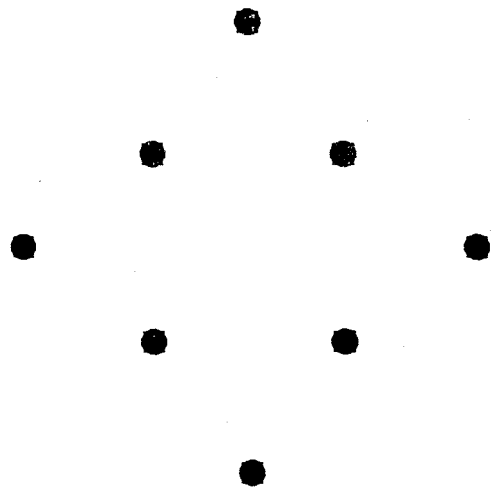
Index = 3 Nullity = 1



(0.000923, -0.202139 , 0.000000) 0.202141
(-0.072256, 0.129323 , 0.000000) 0.148140
(0.162978, 0.357974 , 0.000000) 0.393328
(0.203335, -0.031940 , 0.000000) 0.205828
(-0.091184, -0.446615 , 0.000000) 0.455828
(0.459916, 0.000000 , 0.000000) 0.459916
(-0.359853, -0.103669 , 0.000000) 0.374488
(-0.303859, 0.297066 , 0.000000) 0.424945

Potential = 63.180802

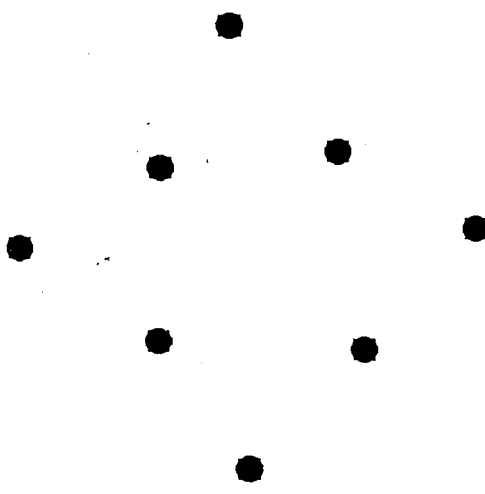
Index = 2 Nullity = 1



(0.178789, 0.178789 , 0.000000) 0.252846
(0.000000, 0.431357 , 0.000000) 0.431357
(0.000000, -0.431357 , 0.000000) 0.431357
(-0.178789, -0.178789 , 0.000000) 0.252846
(0.178789, -0.178789 , 0.000000) 0.252846
(-0.178789, 0.178789 , 0.000000) 0.252846
(-0.431357, 0.000000 , 0.000000) 0.431357
(0.431357, 0.000000 , 0.000000) 0.431357

Potential = 62.451937

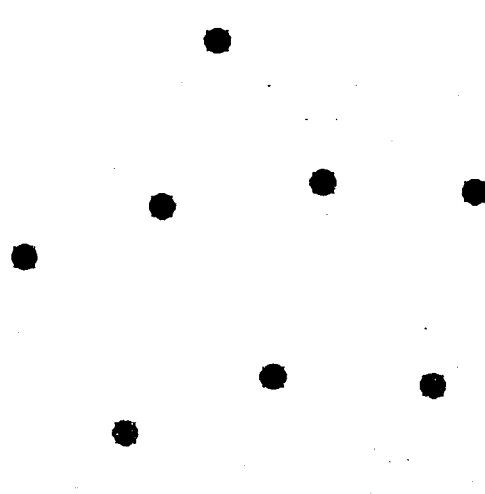
Index = 3 Nullity = 1



(0.165660, 0.153255 , 0.000000) 0.225678
(0.003365, -0.427586 , 0.000000) 0.427599
(-0.426033, 0.036568 , 0.000000) 0.427599
(0.171010, -0.180634 , 0.000000) 0.248743
(-0.213751, -0.197745 , 0.000000) 0.291191
(-0.166805, 0.184524 , 0.000000) 0.248743
(0.033628, 0.431617 , 0.000000) 0.432925
(0.432925, -0.000000 , 0.000000) 0.432925

Potential = 62.448581

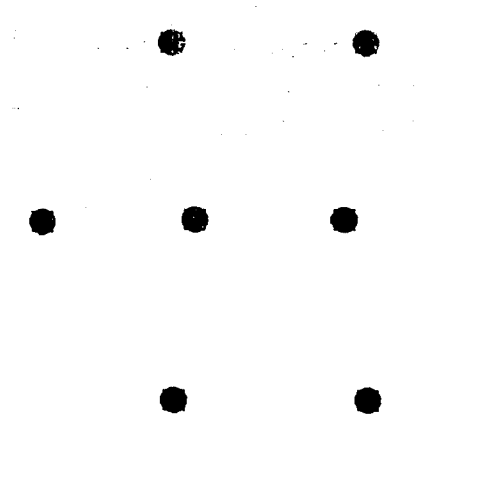
Index = 2 Nullity = 1



(0.065212, -0.415928 , 0.000000) 0.421009
(0.165565, -0.102477 , 0.000000) 0.194713
(-0.406554, -0.130697 , 0.000000) 0.427045
(-0.126257, -0.148231 , 0.000000) 0.194713
(0.427045, -0.000000 , 0.000000) 0.427045
(-0.035363, 0.225552 , 0.000000) 0.228308
(0.236850, 0.330053 , 0.000000) 0.406242
(-0.326497, 0.241728 , 0.000000) 0.406242

Potential = 62.410790

Index = 2 Nullity = 1



(0.429369, -0.000000 , 0.000000) 0.429369
(-0.429369, -0.000000 , 0.000000) 0.429369
(0.138430, 0.000000 , 0.000000) 0.138430
(0.180347, -0.340169 , 0.000000) 0.385019
(0.180347, 0.340169 , 0.000000) 0.385019
(-0.138430, 0.000000 , 0.000000) 0.138430
(-0.180347, -0.340169 , 0.000000) 0.385019
(-0.180347, 0.340169 , 0.000000) 0.385019

Potential = 61.723054

Index = 1 Nullity = 1

(0.158885, 0.382462, 0.000000) 0.414151
(-0.119388, -0.079683, 0.000000) 0.143537
(-0.204992, 0.307137, 0.000000) 0.369263
(0.204992, -0.307137, 0.000000) 0.369263
(0.414151, 0.000000, 0.000000) 0.414151
(-0.158885, -0.382462, 0.000000) 0.414151
(-0.414151, -0.000000, 0.000000) 0.414151
(0.119388, 0.079683, 0.000000) 0.143537

Potential = 61.667904

Index = 1 Nullity = 1

(0.235657, -0.295505, 0.000000) 0.377964
(0.000000, 0.000000, 0.000000) 0.000000
(0.235657, 0.295505, 0.000000) 0.377964
(-0.084105, -0.368488, 0.000000) 0.377964
(-0.340534, -0.163993, 0.000000) 0.377964
(-0.084105, 0.368488, 0.000000) 0.377964
(0.377964, -0.000000, 0.000000) 0.377964
(-0.340534, 0.163993, 0.000000) 0.377964

Potential = 61.205102

Index = 0 Nullity = 1