Pràctica 2: Implementació del Simplex Primal

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2 de novembre de 2016

1 Informació

[Arxiu adjunt: Simplex.m]
Els conjunts de dades assignats per aquesta pràctica són el 10 i el 55.

2 Observacions

2.1 Fase I

Hem escollit integrar la fase I al codi. Aquesta utilitza la matriu A i els vector b i c per identificar una primera solució bàsica factible amb la qual començar la Fase II.
Aquesta última, a cada iteració, donades les mateixes dades que a la Fase I i, a més, una base factible del problema amb la seva solució bàsica factible associada, detecta si la solució en qüestió és òptima, comprova si el problema és il·limitat i, si no, calcula una nova base factible amb una solució bàsica factible que millori la funció objectiu.

2.2 Taxació

Implementem tant la regla de Bland com la regla dels costos reduïts més negatius al mateix script, per optar a una o l'altra cal canviar el valor "Bland".

2.3 Tractament de degeneració

Com tenim la opció de fer la regla de Bland, tractem la degeneració activant la regla de Bland i deixant iterar l'algorisme.

2.4 Inversa de la Matriu Bàsica

Per al càlcul de la matriu inversa de B hem optat per fer servir la matriu E (vist a classe) per a actualitzar B^{-1} en cada iteració (a excepció de la primera iteració de cada fase, on això no és possible), agilitzant el cost computacional de l'algorisme.

2.5 Problemes Infactibles

Si el problema a resoldre és infactible, l'algorisme ho detectarà al acabar la Fase I, ja que si la funció objectiu és positiva (o, com veurem més endevant, no molt propera a zero) vol dir que cal donar valors positius a alguna de les variables artificials per poder resoldre el sistema. És a dir, que s'ha necessitat una columna artificial per completar el rang de la matriu.

2.6 Errors de càlcul

Al fer moltes iteracions per resoldre el problema, els errors de càlcul que comet l'ordinador es van acumulant, podent fer que el resultat no sigui correcte. És per això que, al acabar la fase I, enlloc de comprovar si $z = 0$ el que comprovem és si z és menor a una certa tolerància.

3 Resultats

3.1 Conjunt de Dades 10, Problema 1

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 27, theta* = 0.27, z = 1956.157
Iteracio 2 : iout = 0, q = 2, B(p) = 30, theta* = 0.19, z = 1835.686
Iteracio 3 : iout = 0, q = 3, B(p) = 29, theta* = 0.12, z = 1810.967
Iteracio 4 : iout = 0, q = 4, B(p) = 26, theta* = 0.10, z = 1730.924
Iteracio 5 : iout = 0, q = 5, B(p) = 4, theta* = 0.47, z = 1629.776
Iteracio 6 : iout = 0, q = 27, B(p) = 28, theta* = 94.14, z = 1469.797
Iteracio 7 : iout = 0, q = 30, B(p) = 27, theta* = 36.35, z = 1421.589
Iteracio 8 : iout = 0, q = 6, B(p) = 1, theta* = 0.82, z = 1421.013
Iteracio 9 : iout = 0, q = 7, B(p) = 21, theta* = 1.09, z = 1327.536
Iteracio 10 : iout = 0, q = 1, B(p) = 6, theta* = 0.48, z = 1234.097
Iteracio 11 : iout = 0, q = 8, B(p) = 25, theta* = 0.51, z = 1199.014
Iteracio 12 : iout = 0, q = 29, B(p) = 22, theta* = 507.23, z = 1160.254
Iteracio 13 : iout = 0, q = 9, B(p) = 3, theta* = 2.01, z =  958.135
Iteracio 14 : iout = 0, q = 22, B(p) = 29, theta* = 272.72, z =  771.137
Iteracio 15 : iout = 0, q = 10, B(p) = 23, theta* = 0.97, z =  386.621
Iteracio 16 : iout = 0, q = 4, B(p) = 24, theta* = 0.23, z =  274.006
Iteracio 17 : iout = 0, q = 3, B(p) = 4, theta* = 0.70, z =  266.082
Iteracio 18 : iout = 0, q = 6, B(p) = 9, theta* = 1.06, z =  260.245
Iteracio 19 : iout = 0, q = 11, B(p) = 6, theta* = 0.37, z =  200.001
Iteracio 20 : iout = 0, q = 4, B(p) = 22, theta* = 1.40, z =  81.863
Iteracio 21 : iout = 0, q = 13, B(p) = 30, theta* = 1.69, z =  -0.000
SBF trobada
Fase II
Iteracio 22 : iout = 0, q = 9, B(p) = 10, theta* = 1.49, z =  248.032
Iteracio 23 : iout = 0, q = 14, B(p) = 3, theta* = 0.19, z =  177.110
Iteracio 24 : iout = 0, q = 10, B(p) = 13, theta* = 1.98, z =  122.027
Iteracio 25 : iout = 0, q = 12, B(p) = 7, theta* = 2.63, z = -132.616
Iteracio 26 : iout = 0, q = 13, B(p) = 5, theta* = 0.08, z = -134.977
Iteracio 27 : iout = 0, q = 15, B(p) = 14, theta* = 365.40, z = -167.494
Iteracio 28 : iout = 0, q = 16, B(p) = 1, theta* = 396.31, z = -309.178
Iteracio 29 : iout = 0, q = 17, B(p) = 2, theta* = 1.18, z = -310.213
Iteracio 30 : iout = 0, q = 5, B(p) = 8, theta* = 0.46, z = -334.007
Iteracio 31 : iout = 0, q = 14, B(p) = 13, theta* = 1.07, z = -430.831
Iteracio 32 : iout = 0, q = 8, B(p) = 15, theta* = 0.40, z = -467.904
Iteracio 33 : iout = 0, q = 19, B(p) = 8, theta* = 57.41, z = -486.367
Iteracio 34 : iout = 0, q = 20, B(p) = 14, theta* = 224.47, z = -520.223
Solucio optima trobada, iteracio 34, z = -520.223
Fi del simplex primal
Solucio optima:
base =
    12     4     9    19     5    20    16    10    11    17
xb =
    2.7334    2.8801    5.1418  150.1295    0.8764  224.4677  579.3937    2.2320
            0.6360   97.1503
z =
 -520.2228
r =
  122.6035    0.4621  118.3616  137.9023   33.6201   47.3763  159.0863    0.1386
          43.0010   20.6711
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3.2 Conjunt de Dades 10, Problema 2

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 30, theta* = 2.18, z = 2327.411
Iteracio 2 : iout = 0, q = 2, B(p) = 21, theta* = 1.05, z = 2077.613
Iteracio 3 : iout = 0, q = 3, B(p) = 23, theta* = 0.13, z = 2040.542
Iteracio 4 : iout = 0, q = 4, B(p) = 3, theta* = 0.41, z = 1975.756
Iteracio 5 : iout = 0, q = 21, B(p) = 2, theta* = 40.10, z = 1883.317
Iteracio 6 : iout = 0, q = 6, B(p) = 22, theta* = 0.74, z = 1723.487
Iteracio 7 : iout = 0, q = 7, B(p) = 28, theta* = 0.35, z = 1641.901
Iteracio 8 : iout = 0, q = 8, B(p) = 26, theta* = 0.52, z = 1415.332
Iteracio 9 : iout = 0, q = 2, B(p) = 21, theta* = 0.14, z = 1381.637
Iteracio 10 : iout = 0, q = 30, B(p) = 1, theta* = 52.31, z = 1338.142
Iteracio 11 : iout = 0, q = 5, B(p) = 24, theta* = 0.55, z = 1322.644
Iteracio 12 : iout = 0, q = 22, B(p) = 5, theta* = 76.53, z = 1221.983
Iteracio 13 : iout = 0, q = 1, B(p) = 6, theta* = 1.74, z = 1080.719
Iteracio 14 : iout = 0, q = 10, B(p) = 27, theta* = 0.59, z =  933.473
Iteracio 15 : iout = 0, q = 6, B(p) = 29, theta* = 0.45, z =  905.514
Iteracio 16 : iout = 0, q = 5, B(p) = 2, theta* = 0.45, z =  876.496
Iteracio 17 : iout = 0, q = 9, B(p) = 4, theta* = 0.02, z =  871.283
Iteracio 18 : iout = 0, q = 11, B(p) = 30, theta* = 0.04, z =  840.336
Iteracio 19 : iout = 0, q = 3, B(p) = 10, theta* = 2.67, z =  435.127
Iteracio 20 : iout = 0, q = 2, B(p) = 1, theta* = 1.44, z =  270.034
Iteracio 21 : iout = 0, q = 12, B(p) = 7, theta* = 0.33, z =  142.035
Iteracio 22 : iout = 0, q = 1, B(p) = 25, theta* = 0.09, z =  136.741
Iteracio 23 : iout = 0, q = 13, B(p) = 1, theta* = 0.28, z =  78.337
Iteracio 24 : iout = 0, q = 29, B(p) = 22, theta* = 16.43, z =  16.431
Iteracio 25 : iout = 0, q = 23, B(p) = 29, theta* = 6.09, z =  6.090
Iteracio 26 : iout = 0, q = 4, B(p) = 23, theta* = 0.06, z =  -0.000
SBF trobada
Fase II
Iteracio 27 : iout = 0, q = 18, B(p) = 8, theta* = 315.79, z = -644.542
Iteracio 28 : iout = 0, q = 19, B(p) = 5, theta* = 333.11, z = -709.018
Solucio optima trobada, iteracio 28, z = -709.018
Fi del simplex primal
Solucio optima:
base =
    19     2     9     4    13    18     3    12     6    11
xb =
  333.1076    2.3381    1.9319    1.1814    0.1318  108.0757    1.4591    1.8980
            0.8771    3.2170
z =
 -709.0183
r =
   48.8310  151.3618   59.7230   40.2335    0.5348    0.1167    0.5252   36.8256
           49.8478    0.0189
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3.3 Conjunt de Dades 10, Problema 3

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 24, theta* = 0.40, z = 1118.597
Iteracio 2 : iout = 0, q = 2, B(p) = 30, theta* = 0.29, z = 1027.017
Iteracio 3 : iout = 0, q = 6, B(p) = 1, theta* = 0.28, z = 1015.200
Iteracio 4 : iout = 0, q = 9, B(p) = 22, theta* = 0.67, z =  783.861
Iteracio 5 : iout = 0, q = 24, B(p) = 29, theta* = 4.12, z =  747.064
Iteracio 6 : iout = 0, q = 30, B(p) = 2, theta* = 12.32, z =  721.041
Iteracio 7 : iout = 0, q = 3, B(p) = 30, theta* = 0.14, z =  717.276
Iteracio 8 : iout = 0, q = 1, B(p) = 24, theta* = 0.02, z =  714.542
Iteracio 9 : iout = 0, q = 30, B(p) = 3, theta* = 6.54, z =  703.505
Iteracio 10 : iout = 0, q = 8, B(p) = 1, theta* = 0.07, z =  697.203
Iteracio 11 : iout = 0, q = 11, B(p) = 28, theta* = 0.06, z =  681.653
Iteracio 12 : iout = 0, q = 15, B(p) = 25, theta* = 39.50, z =  642.154
Iteracio 13 : iout = 0, q = 3, B(p) = 30, theta* = 0.02, z =  641.542
Iteracio 14 : iout = 0, q = 14, B(p) = 3, theta* = 0.07, z =  638.972
Iteracio 15 : iout = 0, q = 24, B(p) = 11, theta* = 2.41, z =  637.550
Iteracio 16 : iout = 0, q = 30, B(p) = 8, theta* = 1.77, z =  637.509
Iteracio 17 : iout = 0, q = 3, B(p) = 30, theta* = 0.03, z =  636.334
Iteracio 18 : iout = 0, q = 17, B(p) = 27, theta* = 65.38, z =  570.952
Iteracio 19 : iout = 0, q = 29, B(p) = 3, theta* = 3.41, z =  569.563
Iteracio 20 : iout = 0, q = 7, B(p) = 29, theta* = 0.04, z =  569.233
Iteracio 21 : iout = 0, q = 12, B(p) = 7, theta* = 0.02, z =  566.504
Iteracio 22 : iout = 0, q = 19, B(p) = 12, theta* = 3.41, z =  566.150
Problema Infactible
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3.4 Conjunt de Dades 10, Problema 4

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 25, theta* = 6.60, z = 3862.409
Iteracio 2 : iout = 0, q = 2, B(p) = 29, theta* = 3.89, z = 2939.685
Iteracio 3 : iout = 0, q = 3, B(p) = 32, theta* = 1.38, z = 2334.725
Iteracio 4 : iout = 0, q = 4, B(p) = 34, theta* = 3.54, z = 1766.504
Iteracio 5 : iout = 0, q = 29, B(p) = 30, theta* = 217.18, z = 1687.086
Iteracio 6 : iout = 0, q = 5, B(p) = 2, theta* = 1.13, z = 1591.856
Iteracio 7 : iout = 0, q = 30, B(p) = 28, theta* = 372.22, z = 1315.186
Iteracio 8 : iout = 0, q = 6, B(p) = 1, theta* = 2.53, z =  961.683
Iteracio 9 : iout = 0, q = 34, B(p) = 33, theta* = 62.64, z =  787.294
Iteracio 10 : iout = 0, q = 8, B(p) = 29, theta* = 0.34, z =  695.842
Iteracio 11 : iout = 0, q = 33, B(p) = 30, theta* = 91.30, z =  368.609
Iteracio 12 : iout = 0, q = 2, B(p) = 26, theta* = 0.46, z =  270.184
Iteracio 13 : iout = 0, q = 7, B(p) = 27, theta* = 0.03, z =  266.862
Iteracio 14 : iout = 0, q = 26, B(p) = 31, theta* = 104.79, z =  217.073
Iteracio 15 : iout = 0, q = 1, B(p) = 26, theta* = 0.73, z =  209.071
Iteracio 16 : iout = 0, q = 10, B(p) = 33, theta* = 0.70, z =  195.912
Iteracio 17 : iout = 0, q = 11, B(p) = 34, theta* = 1.95, z =  -0.000
SBF trobada
Fase II
Iteracio 18 : iout = 0, q = 13, B(p) = 3, theta* = 3.12, z = -914.900
Iteracio 19 : iout = 0, q = 14, B(p) = 6, theta* = 0.11, z = -926.543
Iteracio 20 : iout = 0, q = 3, B(p) = 11, theta* = 0.01, z = -927.080
Iteracio 21 : iout = 0, q = 15, B(p) = 3, theta* = 0.50, z = -927.393
Iteracio 22 : iout = 0, q = 6, B(p) = 14, theta* = 0.37, z = -942.839
Iteracio 23 : iout = 0, q = 12, B(p) = 10, theta* = 0.61, z = -952.563
Iteracio 24 : iout = 0, q = 3, B(p) = 12, theta* = 0.15, z = -966.492
Iteracio 25 : iout = 0, q = 16, B(p) = 3, theta* = 13.76, z = -972.083
Iteracio 26 : iout = 0, q = 14, B(p) = 6, theta* = 0.95, z = -973.099
Iteracio 27 : iout = 0, q = 17, B(p) = 14, theta* = 92.04, z = -1004.973
Iteracio 28 : iout = 0, q = 3, B(p) = 16, theta* = 0.41, z = -1005.841
Iteracio 29 : iout = 0, q = 18, B(p) = 13, theta* = 81.05, z = -1051.551
Iteracio 30 : iout = 0, q = 6, B(p) = 1, theta* = 0.58, z = -1052.621
Iteracio 31 : iout = 0, q = 16, B(p) = 6, theta* = 107.21, z = -1137.769
Iteracio 32 : iout = 0, q = 9, B(p) = 3, theta* = 0.55, z = -1157.876
Iteracio 33 : iout = 0, q = 11, B(p) = 9, theta* = 0.17, z = -1199.424
Iteracio 34 : iout = 0, q = 20, B(p) = 11, theta* = 57.35, z = -1219.737
Iteracio 35 : iout = 0, q = 6, B(p) = 2, theta* = 0.36, z = -1223.348
Iteracio 36 : iout = 0, q = 21, B(p) = 6, theta* = 25.95, z = -1270.318
Iteracio 37 : iout = 0, q = 3, B(p) = 5, theta* = 0.64, z = -1321.966
Iteracio 38 : iout = 0, q = 13, B(p) = 15, theta* = 3.45, z = -1331.711
Iteracio 39 : iout = 0, q = 19, B(p) = 3, theta* = 36.67, z = -1400.692
Iteracio 40 : iout = 0, q = 14, B(p) = 7, theta* = 2.69, z = -1431.162
Iteracio 41 : iout = 0, q = 15, B(p) = 13, theta* = 385.52, z = -1499.816
Iteracio 42 : iout = 0, q = 11, B(p) = 15, theta* = 4.78, z = -1884.048
Iteracio 43 : iout = 0, q = 22, B(p) = 14, theta* = 30.45, z = -1986.052
Iteracio 44 : iout = 0, q = 10, B(p) = 11, theta* = 3.03, z = -2095.509
Iteracio 45 : iout = 0, q = 9, B(p) = 10, theta* = 2.15, z = -2318.861
Iteracio 46 : iout = 0, q = 3, B(p) = 9, theta* = 2.21, z = -2426.874
Iteracio 47 : iout = 0, q = 15, B(p) = 3, theta* = 228.43, z = -2483.484
Iteracio 48 : iout = 0, q = 23, B(p) = 15, theta* = 1288.14, z = -5849.825
Iteracio 49 : iout = 0, q = 1, B(p) = 4, theta* = 2.16, z = -8300.591
Iteracio 50 : iout = 0, q = 24, B(p) = 1, theta* = 333.20, z = -12280.000
Problema il limitat
Fi del simplex primal
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3.5 Conjunt de Dades 55, Problema 1

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 27, theta* = 0.01, z = 2409.100
Iteracio 2 : iout = 0, q = 2, B(p) = 1, theta* = 0.01, z = 2409.043
Iteracio 3 : iout = 0, q = 3, B(p) = 21, theta* = 0.59, z = 2123.705
Iteracio 4 : iout = 0, q = 27, B(p) = 2, theta* = 28.63, z = 2113.579
Iteracio 5 : iout = 0, q = 1, B(p) = 27, theta* = 0.26, z = 2098.569
Iteracio 6 : iout = 0, q = 4, B(p) = 23, theta* = 0.50, z = 1817.551
Iteracio 7 : iout = 0, q = 2, B(p) = 28, theta* = 0.75, z = 1660.427
Iteracio 8 : iout = 0, q = 21, B(p) = 3, theta* = 48.81, z = 1605.401
Iteracio 9 : iout = 0, q = 5, B(p) = 26, theta* = 0.08, z = 1557.199
Iteracio 10 : iout = 0, q = 27, B(p) = 30, theta* = 51.82, z = 1463.435
Iteracio 11 : iout = 0, q = 3, B(p) = 21, theta* = 0.86, z = 1336.936
Iteracio 12 : iout = 0, q = 23, B(p) = 27, theta* = 0.85, z = 1335.791
Iteracio 13 : iout = 0, q = 21, B(p) = 29, theta* = 67.67, z = 1324.836
Iteracio 14 : iout = 0, q = 6, B(p) = 21, theta* = 0.80, z = 1066.636
Iteracio 15 : iout = 0, q = 28, B(p) = 3, theta* = 77.50, z = 1044.937
Iteracio 16 : iout = 0, q = 27, B(p) = 28, theta* = 55.17, z =  961.853
Iteracio 17 : iout = 0, q = 8, B(p) = 1, theta* = 0.36, z =  883.790
Iteracio 18 : iout = 0, q = 29, B(p) = 24, theta* = 62.79, z =  842.338
Iteracio 19 : iout = 0, q = 28, B(p) = 29, theta* = 17.83, z =  804.780
Iteracio 20 : iout = 0, q = 7, B(p) = 28, theta* = 0.26, z =  780.978
Iteracio 21 : iout = 0, q = 1, B(p) = 23, theta* = 0.14, z =  779.182
Iteracio 22 : iout = 0, q = 10, B(p) = 7, theta* = 0.95, z =  538.379
Iteracio 23 : iout = 0, q = 26, B(p) = 27, theta* = 89.65, z =  404.642
Iteracio 24 : iout = 0, q = 3, B(p) = 2, theta* = 1.26, z =  355.871
Iteracio 25 : iout = 0, q = 9, B(p) = 25, theta* = 0.25, z =  316.855
Iteracio 26 : iout = 0, q = 2, B(p) = 3, theta* = 0.34, z =  249.441
Iteracio 27 : iout = 0, q = 24, B(p) = 8, theta* = 51.34, z =  246.415
Iteracio 28 : iout = 0, q = 28, B(p) = 26, theta* = 11.60, z =  244.819
Iteracio 29 : iout = 0, q = 11, B(p) = 28, theta* = 0.20, z =  196.924
Iteracio 30 : iout = 0, q = 8, B(p) = 24, theta* = 0.09, z =  120.565
Iteracio 31 : iout = 0, q = 3, B(p) = 6, theta* = 3.00, z =  30.690
Iteracio 32 : iout = 0, q = 29, B(p) = 22, theta* = 29.73, z =  29.727
Iteracio 33 : iout = 0, q = 7, B(p) = 29, theta* = 0.17, z =  0.000
SBF trobada
Fase II
Iteracio 34 : iout = 0, q = 17, B(p) = 4, theta* = 207.07, z = -706.532
Iteracio 35 : iout = 0, q = 6, B(p) = 8, theta* = 0.44, z = -734.419
Iteracio 36 : iout = 0, q = 12, B(p) = 7, theta* = 0.05, z = -786.620
Iteracio 37 : iout = 0, q = 13, B(p) = 6, theta* = 0.08, z = -801.905
Iteracio 38 : iout = 0, q = 18, B(p) = 13, theta* = 79.55, z = -860.028
Iteracio 39 : iout = 0, q = 7, B(p) = 2, theta* = 0.07, z = -938.105
Iteracio 40 : iout = 0, q = 14, B(p) = 5, theta* = 0.42, z = -948.471
Solucio optima trobada, iteracio 40, z = -948.471
Fi del simplex primal
Solucio optima:
base =
    11    12    17    10     9    14    18     7     3     1
xb =
    1.4594    0.8636  664.3604    5.3055    1.2950    0.4248  272.7265    0.1501
            0.6442    4.2500
z =
 -948.4705
r =
  186.2178   91.7305  202.0726   39.5675    1.0149    0.9102   37.7126  158.6999
           0.7030    0.8416
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3.6 Conjunt de Dades 55, Problema 2

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Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 26, theta* = 1.05, z = 2574.073
Iteracio 2 : iout = 0, q = 2, B(p) = 27, theta* = 0.63, z = 2415.526
Iteracio 3 : iout = 0, q = 3, B(p) = 24, theta* = 1.17, z = 2131.182
Iteracio 4 : iout = 0, q = 26, B(p) = 2, theta* = 5.10, z = 2114.472
Iteracio 5 : iout = 0, q = 5, B(p) = 26, theta* = 0.05, z = 2088.310
Iteracio 6 : iout = 0, q = 6, B(p) = 3, theta* = 1.39, z = 2014.752
Iteracio 7 : iout = 0, q = 8, B(p) = 29, theta* = 0.94, z = 1730.709
Iteracio 8 : iout = 0, q = 4, B(p) = 1, theta* = 0.56, z = 1679.654
Iteracio 9 : iout = 0, q = 9, B(p) = 30, theta* = 0.35, z = 1494.690
Iteracio 10 : iout = 0, q = 24, B(p) = 22, theta* = 92.69, z = 1423.607
Iteracio 11 : iout = 0, q = 2, B(p) = 6, theta* = 0.29, z = 1417.196
Iteracio 12 : iout = 0, q = 1, B(p) = 4, theta* = 2.48, z = 1187.821
Iteracio 13 : iout = 0, q = 22, B(p) = 24, theta* = 17.59, z = 1186.351
Iteracio 14 : iout = 0, q = 26, B(p) = 22, theta* = 24.21, z = 1163.647
Iteracio 15 : iout = 0, q = 3, B(p) = 26, theta* = 0.06, z = 1147.999
Iteracio 16 : iout = 0, q = 4, B(p) = 1, theta* = 2.43, z = 1042.071
Iteracio 17 : iout = 0, q = 10, B(p) = 25, theta* = 0.69, z =  771.889
Iteracio 18 : iout = 0, q = 6, B(p) = 21, theta* = 2.76, z =  450.366
Iteracio 19 : iout = 0, q = 7, B(p) = 3, theta* = 0.89, z =  410.067
Iteracio 20 : iout = 0, q = 30, B(p) = 6, theta* = 184.85, z =  379.424
Iteracio 21 : iout = 0, q = 12, B(p) = 9, theta* = 0.29, z =  359.156
Iteracio 22 : iout = 0, q = 6, B(p) = 30, theta* = 1.83, z =  357.670
Iteracio 23 : iout = 0, q = 11, B(p) = 2, theta* = 1.46, z =  355.303
Iteracio 24 : iout = 0, q = 1, B(p) = 5, theta* = 1.12, z =  354.819
Iteracio 25 : iout = 0, q = 13, B(p) = 28, theta* = 1.49, z =  148.626
Iteracio 26 : iout = 0, q = 21, B(p) = 4, theta* = 53.99, z =  91.011
Iteracio 27 : iout = 0, q = 5, B(p) = 23, theta* = 0.33, z =  80.428
Iteracio 28 : iout = 0, q = 29, B(p) = 5, theta* = 48.72, z =  65.034
Iteracio 29 : iout = 0, q = 4, B(p) = 21, theta* = 0.06, z =  63.020
Iteracio 30 : iout = 0, q = 2, B(p) = 4, theta* = 0.04, z =  58.119
Iteracio 31 : iout = 0, q = 5, B(p) = 29, theta* = 1.62, z =  -0.000
SBF trobada
Fase II
Iteracio 32 : iout = 0, q = 9, B(p) = 12, theta* = 0.22, z = -239.451
Iteracio 33 : iout = 0, q = 14, B(p) = 7, theta* = 0.35, z = -387.711
Iteracio 34 : iout = 0, q = 16, B(p) = 5, theta* = 251.47, z = -467.494
Iteracio 35 : iout = 0, q = 17, B(p) = 11, theta* = 12.57, z = -470.727
Iteracio 36 : iout = 0, q = 18, B(p) = 17, theta* = 20.85, z = -470.910
Iteracio 37 : iout = 0, q = 20, B(p) = 2, theta* = 126.52, z = -566.223
Iteracio 38 : iout = 0, q = 3, B(p) = 14, theta* = 1.80, z = -603.666
Iteracio 39 : iout = 0, q = 11, B(p) = 3, theta* = 1.12, z = -607.769
Iteracio 40 : iout = 0, q = 17, B(p) = 11, theta* = 169.92, z = -714.766
Iteracio 41 : iout = 0, q = 19, B(p) = 1, theta* = 86.13, z = -722.621
Iteracio 42 : iout = 0, q = 2, B(p) = 13, theta* = 0.14, z = -723.939
Solucio optima trobada, iteracio 42, z = -723.939
Fi del simplex primal
Solucio optima:
base =
     6    17    16    18    10    20    19     2     8     9
xb =
    2.4038  261.1016  668.3034  363.2464    3.4425  434.6705  124.5015    0.1403
            4.8161    2.9391
z =
 -723.9394
r =
  160.2853   62.3552  133.3848  113.6042    0.5313  132.1589   46.1953   68.6913
           22.5421    3.1909
```

3.7 Conjunt de Dades 55, Problema 3

```
Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 24, theta* = 0.04, z = 1661.266
Iteracio 2 : iout = 0, q = 2, B(p) = 28, theta* = 0.50, z = 1332.404
Iteracio 3 : iout = 0, q = 4, B(p) = 2, theta* = 0.71, z = 1298.859
Iteracio 4 : iout = 0, q = 6, B(p) = 30, theta* = 0.75, z = 1271.574
Iteracio 5 : iout = 0, q = 2, B(p) = 4, theta* = 0.03, z = 1269.297
Iteracio 6 : iout = 0, q = 8, B(p) = 2, theta* = 0.04, z = 1266.636
Iteracio 7 : iout = 0, q = 10, B(p) = 8, theta* = 0.18, z = 1218.917
Iteracio 8 : iout = 0, q = 24, B(p) = 6, theta* = 15.30, z = 1045.202
Iteracio 9 : iout = 0, q = 11, B(p) = 24, theta* = 0.25, z = 1031.280
Iteracio 10 : iout = 0, q = 14, B(p) = 10, theta* = 0.55, z =  994.290
Iteracio 11 : iout = 0, q = 24, B(p) = 29, theta* = 7.93, z =  992.138
Iteracio 12 : iout = 0, q = 17, B(p) = 27, theta* = 266.14, z =  725.995
Iteracio 13 : iout = 0, q = 19, B(p) = 24, theta* = 6.24, z =  722.782
Iteracio 14 : iout = 0, q = 10, B(p) = 14, theta* = 0.64, z =  718.586
Iteracio 15 : iout = 0, q = 20, B(p) = 11, theta* = 10.43, z =  716.784
Problema Infactible
```

3.8 Conjunt de Dades 55, Problema 4

```
Fase I
Iteracio 1 : iout = 0, q = 1, B(p) = 32, theta* = 7.60, z = 2876.534
Iteracio 2 : iout = 0, q = 2, B(p) = 25, theta* = 2.02, z = 2126.702
Iteracio 3 : iout = 0, q = 32, B(p) = 34, theta* = 61.43, z = 2021.746
Iteracio 4 : iout = 0, q = 3, B(p) = 31, theta* = 2.26, z = 1306.742
Iteracio 5 : iout = 0, q = 25, B(p) = 30, theta* = 82.09, z = 1099.575
Iteracio 6 : iout = 0, q = 4, B(p) = 25, theta* = 0.72, z = 978.465
Iteracio 7 : iout = 0, q = 5, B(p) = 27, theta* = 0.49, z = 950.904
Iteracio 8 : iout = 0, q = 6, B(p) = 5, theta* = 0.88, z = 907.089
Iteracio 9 : iout = 0, q = 7, B(p) = 32, theta* = 0.83, z = 785.779
Iteracio 10 : iout = 0, q = 25, B(p) = 3, theta* = 1.93, z = 782.923
Iteracio 11 : iout = 0, q = 8, B(p) = 33, theta* = 0.17, z = 742.821
Iteracio 12 : iout = 0, q = 3, B(p) = 29, theta* = 2.99, z = 324.492
Iteracio 13 : iout = 0, q = 30, B(p) = 28, theta* = 8.11, z = 301.996
Iteracio 14 : iout = 0, q = 5, B(p) = 30, theta* = 0.10, z = 293.304
Iteracio 15 : iout = 0, q = 9, B(p) = 25, theta* = 0.64, z = 280.046
Iteracio 16 : iout = 0, q = 29, B(p) = 2, theta* = 13.77, z = 264.299
Iteracio 17 : iout = 0, q = 10, B(p) = 7, theta* = 2.69, z = 254.038
Iteracio 18 : iout = 0, q = 11, B(p) = 6, theta* = 0.58, z = 208.865
Iteracio 19 : iout = 0, q = 34, B(p) = 3, theta* = 8.66, z = 203.713
Iteracio 20 : iout = 0, q = 2, B(p) = 26, theta* = 2.15, z = 146.309
Iteracio 21 : iout = 0, q = 3, B(p) = 29, theta* = 0.35, z = 144.015
Iteracio 22 : iout = 0, q = 7, B(p) = 1, theta* = 0.24, z = 137.863
Iteracio 23 : iout = 0, q = 29, B(p) = 3, theta* = 10.09, z = 129.900
Iteracio 24 : iout = 0, q = 26, B(p) = 34, theta* = 81.75, z = 111.638
Iteracio 25 : iout = 0, q = 12, B(p) = 26, theta* = 1.16, z = 102.492
Iteracio 26 : iout = 0, q = 13, B(p) = 10, theta* = 0.37, z = 72.927
Iteracio 27 : iout = 0, q = 1, B(p) = 4, theta* = 1.50, z = 56.002
Iteracio 28 : iout = 0, q = 14, B(p) = 29, theta* = 0.33, z = 0.000
SBF trobada
Fase II
Iteracio 29 : iout = 0, q = 4, B(p) = 1, theta* = 0.99, z = -860.810
Iteracio 30 : iout = 0, q = 6, B(p) = 8, theta* = 1.07, z = -909.091
Iteracio 31 : iout = 0, q = 10, B(p) = 2, theta* = 0.68, z = -947.619
Iteracio 32 : iout = 0, q = 8, B(p) = 13, theta* = 2.23, z = -1012.738
Iteracio 33 : iout = 0, q = 16, B(p) = 5, theta* = 10.24, z = -1016.715
Iteracio 34 : iout = 0, q = 17, B(p) = 11, theta* = 91.63, z = -1130.057
Iteracio 35 : iout = 0, q = 2, B(p) = 7, theta* = 0.01, z = -1130.552
Iteracio 36 : iout = 0, q = 5, B(p) = 10, theta* = 5.69, z = -1226.938
Iteracio 37 : iout = 0, q = 18, B(p) = 12, theta* = 76.13, z = -1308.886
Iteracio 38 : iout = 0, q = 13, B(p) = 4, theta* = 0.75, z = -1386.325
Iteracio 39 : iout = 0, q = 3, B(p) = 2, theta* = 1.19, z = -1397.078
Iteracio 40 : iout = 0, q = 15, B(p) = 3, theta* = 66.45, z = -1420.619
Iteracio 41 : iout = 0, q = 20, B(p) = 8, theta* = 217.25, z = -1580.025
Iteracio 42 : iout = 0, q = 3, B(p) = 14, theta* = 1.10, z = -1632.906
Iteracio 43 : iout = 0, q = 2, B(p) = 9, theta* = 0.54, z = -1647.407
Iteracio 44 : iout = 0, q = 10, B(p) = 2, theta* = 1.95, z = -1758.327
Iteracio 45 : iout = 0, q = 4, B(p) = 13, theta* = 0.10, z = -1770.525
Iteracio 46 : iout = 0, q = 14, B(p) = 15, theta* = 0.01, z = -1771.060
Iteracio 47 : iout = 0, q = 11, B(p) = 14, theta* = 0.02, z = -1771.308
Iteracio 48 : iout = 0, q = 9, B(p) = 3, theta* = 0.11, z = -1772.254
Iteracio 49 : iout = 0, q = 21, B(p) = 4, theta* = 1.33, z = -1772.814
Iteracio 50 : iout = 0, q = 3, B(p) = 9, theta* = 0.68, z = -1777.831
Iteracio 51 : iout = 0, q = 15, B(p) = 11, theta* = 5.80, z = -1779.692
Iteracio 52 : iout = 0, q = 22, B(p) = 10, theta* = 13.72, z = -1794.277
Iteracio 53 : iout = 0, q = 11, B(p) = 3, theta* = 2.17, z = -1968.131
Iteracio 54 : iout = 0, q = 23, B(p) = 11, theta* = 63.18, z = -2023.092
Iteracio 55 : iout = 0, q = 19, B(p) = 22, theta* = 974.96, z = -2193.896
```

```
Iteracio 56 : iout = 0, q = 8, B(p) = 15, theta* = 1.50, z = -2254.441
Iteracio 57 : iout = 0, q = 4, B(p) = 5, theta* = 1.62, z = -2463.949
Iteracio 58 : iout = 0, q = 24, B(p) = 4, theta* = 212.78, z = -3193.214
Iteracio 59 : iout = 0, q = 14, B(p) = 8, theta* = 3.53, z = -3195.737
Iteracio 60 : iout = 0, q = 22, B(p) = 23, theta* = 8899.62, z = -8348.149
Iteracio 61 : iout = 0, q = 8, B(p) = 6, theta* = 9.95, z = -8522.101
Iteracio 62 : iout = 0, q = 15, B(p) = 8, theta* = 4019.00, z = -64042.000
Problema illimitat
Fi del simplex primal
```