```
     ===============HW 4====================

     Part 3  and Part 5

5
       !!!! Schaffer

     ### sa ###############################################
     # 2014-10-06 16:31:45
10
       Objective Value
        50   --------    *  |  ----------     , 0.08,  0.31,  0.44,  0.58,  0.93
       100   --    *    ----|-------          , 0.03,  0.11,  0.23,  0.37,  0.74
       150    --   *    ---|-----             , 0.11,  0.17,  0.27,  0.42,  0.69
15     200   --    *   -----|-                , 0.08,  0.14,  0.27,  0.34,  0.56
       250   -----      *  |----------        , 0.04,  0.20,  0.38,  0.49,  0.82
       300   ----    *    -|-------           , 0.07,  0.19,  0.33,  0.46,  0.75

       ------------------------------------------------------------
20
       :other options
        a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
     lse
       :sa options
        cooling :0.6  kmax :1000
25
     # Runtime: 1.181 secs
     # The range of f0 during 30 repeats is from 0.0 to 25.0
     # The range of f1 during 30 repeats is from 0.0 to 49.0

30   ### mws ###############################################
     # 2014-10-06 16:31:46

       0.0

35     Objective Value
        50   -----      *     |-------         , 0.04,  0.20,  0.32,  0.50,  0.75
       100   ---     *    ----|---------       , 0.05,  0.13,  0.25,  0.38,  0.81
       150   -----     *     |-------          , 0.07,  0.22,  0.32,  0.50,  0.74
       200   ----    *    ----|--------        , 0.06,  0.17,  0.24,  0.39,  0.78
40     250   ------     *    |----------       , 0.07,  0.26,  0.35,  0.51,  0.83
       300   ----    *     ----|----           , 0.03,  0.13,  0.23,  0.39,  0.65
       350   --    *      -----|-----          , 0.03,  0.12,  0.21,  0.34,  0.68

       ------------------------------------------------------------
45
       :mws options
        max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
       :other options
        a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
     lse
50
     # Runtime: 1.275 secs
     # The range of f0 during 30 repeats is from 0.0 to 25.0
     # The range of f1 during 30 repeats is from 0.0 to 49.0

55     !!!! Fonseca

     ### sa ###############################################
     # 2014-10-06 16:31:47

60
       Objective Value
        50                       -----*, 0.83,  0.99,  1.00,  1.00,  1.00
       100                 -----------*, 0.65,  0.99,  0.99,  1.00,  1.00
       150       -|-------------- *, 0.48,  0.93,  0.99,  1.00,  1.00
65     200                ---------- *, 0.62,  0.92,  0.98,  1.00,  1.00
       250                 ---------- *, 0.59,  0.93,  0.99,  1.00,  1.00
       300       |-------------- *, 0.49,  0.95,  1.00,  1.00,  1.00
       350                 ---*, 0.88,  0.99,  0.99,  1.00,  1.00

70   ------------------------------------------------------------
```

```
       :other options
        a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
     lse
       :sa options
75      cooling :0.6  kmax :1000

     # Runtime: 2.932 secs
     # The range of f0 during 30 repeats is from 0.0 to 25.0
     # The range of f1 during 30 repeats is from 0.0 to 49.0
80
     ### mws ###############################################
     # 2014-10-06 16:31:50

       1.0
85
       Objective Value
        50                        ----------*, 0.69,  0.99,  1.00,  1.00,  1.00
       100                        --*, 0.92,  1.00,  1.00,  1.00,  1.00
       150                        -*, 0.96,  1.00,  1.00,  1.00,  1.00
90     200                        ---*, 0.88,  0.99,  1.00,  1.00,  1.00
       250                        *, 0.98,  1.00,  1.00,  1.00,  1.00
       300                        *, 0.97,  1.00,  1.00,  1.00,  1.00
       350                        --- * , 0.82,  0.94,  0.94,  0.95,  0.95

95   ------------------------------------------------------------

       :mws options
        max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
       :other options
100     a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
     lse

     # Runtime: 3.487 secs
     # The range of f0 during 30 repeats is from 0.0 to 25.0
     # The range of f1 during 30 repeats is from 0.0 to 49.0
105
       !!!! Kursawe

     ### sa ###############################################
     # 2014-10-06 16:31:53
110
       Objective Value
        50   --------     |  *  ------     , 0.11,  0.37,  0.55,  0.65,  0.84
       100       ------   |   *    -----     , 0.28,  0.46,  0.58,  0.74,  0.91
       150       ---   *  |----                , 0.26,  0.34,  0.43,  0.51,  0.64
115    200      ---   *  |-----               , 0.22,  0.32,  0.40,  0.50,  0.69
       250        ------   |  *   ---           , 0.31,  0.49,  0.60,  0.70,  0.80
       300      ----   *  |----                , 0.24,  0.36,  0.43,  0.54,  0.66
       350      ----    |*  ----               , 0.29,  0.41,  0.54,  0.62,  0.73
       400      -----   * ----                 , 0.12,  0.26,  0.31,  0.39,  0.54
120
       ------------------------------------------------------------

       :other options
        a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
     lse
125    :sa options
        cooling :0.6  kmax :1000

     # Runtime: 2.750 secs
     # The range of f0 during 30 repeats is from -18.285 to 25.0
130  # The range of f1 during 30 repeats is from -9.9 to 49.0

     ### mws ###############################################
     # 2014-10-06 16:31:56

135    0.542

       Objective Value
        50    ----    *   |---              , 0.13,  0.26,  0.39,  0.50,  0.61
       100    --------  |*   ------           , 0.16,  0.43,  0.54,  0.69,  0.86
140    150    ------   * |-------             , 0.17,  0.35,  0.47,  0.58,  0.82
       200    -------   |  *  ----            , 0.26,  0.48,  0.62,  0.72,  0.84
```

```
      250       ------    |  *    -----       , 0.23,  0.41,  0.56,  0.70,  0.84
      300       ------    *  |-----           , 0.15,  0.36,  0.46,  0.54,  0.69
      350       --------  |    *              , 0.11,  0.38,  0.56,  0.87,  0.87
145   -------------------------------------------------------

      :mws options
      max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
150   :other options
      a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
      lse

      # Runtime: 3.012 secs
      # The range of f0 during 30 repeats is from -18.812 to 25.0
155   # The range of f1 during 30 repeats is from -9.9 to 49.0

      !!!! ZDT1

      ### sa #################################################
160   # 2014-10-06 16:31:59

      Objective Value
      50        -------   *|-----           , 0.12,  0.36,  0.46,  0.54,  0.68
      100       -----    *   -------         , 0.24,  0.38,  0.51,  0.64,  0.86
165   150       -----    *   ---------       , 0.10,  0.25,  0.49,  0.64,  0.91
      200     -----  *  ---|                 , 0.08,  0.24,  0.29,  0.40,  0.51
      250     ---   *    |-----              , 0.15,  0.27,  0.38,  0.49,  0.68
      300      * -----   |                   , 0.08,  0.08,  0.19,  0.27,  0.40

170   -------------------------------------------------------

      :other options
      a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
      lse
      :sa options
175   cooling :0.6  kmax :1000

      # Runtime: 6.194 secs
      # The range of f0 during 30 repeats is from -18.812 to 25.0
      # The range of f1 during 30 repeats is from -9.9 to 49.0
180
      ### mws #################################################
      # 2014-10-06 16:32:05

      0.0
185
      Objective Value
      50        -----    *|  -----           , 0.16,  0.32,  0.46,  0.55,  0.71
      100       ----     *|  ----------      , 0.23,  0.35,  0.48,  0.55,  0.88
      150       -------   *|  --------       , 0.15,  0.34,  0.47,  0.58,  0.87
190   200     ----     *|  ------            , 0.16,  0.30,  0.43,  0.56,  0.73
      250     -----    *|  -----             , 0.14,  0.31,  0.42,  0.56,  0.73
      300       --------  |   *   ------- , 0.15,  0.37,  0.60,  0.76,  0.99

      -------------------------------------------------------
195
      :mws options
      max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
      :other options
      a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
200   lse
      # Runtime: 5.976 secs
      # The range of f0 during 30 repeats is from -18.812 to 25.0
      # The range of f1 during 30 repeats is from -9.9 to 49.0

205   !!!! ZDT3

      ### sa #################################################
      # 2014-10-06 16:32:11

210   Objective Value
      50        ----     |   *   --       , 0.20,  0.31,  0.61,  0.74,  0.82
```

```
      100       ------    *      -----       , 0.16,  0.35,  0.50,  0.72,  0.85
      150       ---      *|    -----         , 0.16,  0.27,  0.48,  0.64,  0.79
      200     -----     *|  -----            , 0.07,  0.21,  0.42,  0.54,  0.68
215   250       ------    |*   -------        , 0.16,  0.36,  0.53,  0.72,  0.92

      -------------------------------------------------------

      :other options
220   a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
      lse
      :sa options
      cooling :0.6  kmax :1000

      # Runtime: 6.811 secs
225   # The range of f0 during 30 repeats is from -18.812 to 25.0
      # The range of f1 during 30 repeats is from -9.9 to 49.0

      ### mws #################################################
      # 2014-10-06 16:32:18
230
      0.29

      Objective Value
235   50        ---      *  |    -------       , 0.11,  0.21,  0.44,  0.59,  0.79
      100       -----       *     ---          , 0.11,  0.25,  0.50,  0.69,  0.77
      150       --------    *    --            , 0.25,  0.54,  0.69,  0.82,  0.90
      200       -----    *|----                , 0.15,  0.32,  0.44,  0.54,  0.65
      250       -----    |  *    ----           , 0.17,  0.31,  0.56,  0.68,  0.81
240   300   ----------- *  |   ----------       , 0.00,  0.39,  0.41,  0.57,  0.89

      -------------------------------------------------------

      :mws options
245   max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
      :other options
      a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
      lse

      # Runtime: 7.283 secs
250   # The range of f0 during 30 repeats is from -18.812 to 25.0
      # The range of f1 during 30 repeats is from -9.9 to 49.0

      !!!! Viennet3

255   ### sa #################################################
      # 2014-10-06 16:32:25

      Objective Value
260   50   -- *    ------|---------       , 0.05,  0.10,  0.15,  0.32,  0.79
      100 --  *  --------|---              , 0.03,  0.07,  0.15,  0.24,  0.63
      150   -- * --------                  , 0.05,  0.10,  0.15,  0.21,  0.47
      200   -   *   ------                 , 0.04,  0.06,  0.19,  0.31,  0.54
      250 -- *   ------|---------          , 0.03,  0.11,  0.14,  0.24,  0.79
265   300 --- * ---------                  , 0.03,  0.10,  0.15,  0.24,  0.53
      350 --   *    ----|                  , 0.00,  0.08,  0.21,  0.35,  0.46

      -------------------------------------------------------

270   :other options
      a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
      lse
      :sa options
      cooling :0.6  kmax :1000

275   # Runtime: 1.954 secs
      # The range of f0 during 30 repeats is from -18.812 to 25.0
      # The range of f1 during 30 repeats is from -9.9 to 49.0
      # The range of f2 during 30 repeats is from -0.1 to 0.0

280   ### mws #################################################
      # 2014-10-06 16:32:27
```

```
    0.053

285

    Objective Value
      50   --  * -----             |          , 0.09,  0.14,  0.20,  0.26,  0.40
     100   -----*  -------|--      , 0.06,  0.19,  0.21,  0.29,  0.60
290  150  -- *-----       |        , 0.02,  0.09,  0.10,  0.12,  0.29
     200  --*-------      |        , 0.04,  0.09,  0.12,  0.12,  0.35
     250  -- *----        |        , 0.02,  0.08,  0.12,  0.14,  0.26
     300  -  *----        |        , 0.04,  0.08,  0.13,  0.14,  0.27
     350  -- *----------|---       , 0.04,  0.10,  0.12,  0.13,  0.62
295
    ---------------------------------------------------------

    :mws options
     max_changes :1000  max_tries :20  prob :0.25  threshold :0.0001
300  :other options
     a12 :0.56  baseline :10000  era :50  keep :64  lives :4  repeats :30  show :Fa
    lse

    # Runtime: 2.202 secs
    # The range of f0 during 30 repeats is from −18.812 to 25.0
305 # The range of f1 during 30 repeats is from −9.9 to 49.0
    # The range of f2 during 30 repeats is from −0.1 to 0.0
```