

```

In[1]:= p[x_, y_, l_] := x^0.6 y^0.4 - l (10 000 - x^2 - y^2 / 4)^2;

In[2]:= gp[x_, y_, l_] :=
  {{(D[p[xt, yt, l], xt] /. {xt -> x, yt -> y}), (D[p[xt, yt, l], yt] /. {xt -> x, yt -> y})}};
hp[x_, y_, l_] := {{(D[p[xt, yt, l], xt, xt] /. {xt -> x, yt -> y}),
  (D[p[xt, yt, l], xt, yt] /. {xt -> x, yt -> y})},
  {(D[p[xt, yt, l], yt, xt] /. {xt -> x, yt -> y}),
  (D[p[xt, yt, l], yt, yt] /. {xt -> x, yt -> y})}};

In[4]:= xold = {{100.0, 100.0}};
l = 0.05;

In[6]:= gt = gp[xold[[1, 1]], xold[[1, 2]], l];
norm = Sqrt[gt[[1, 1]]^2 + gt[[1, 2]]^2];
While[norm ≥ 0.00001, {gt = gp[xold[[1, 1]], xold[[1, 2]], l];
  ht = hp[xold[[1, 1]], xold[[1, 2]], l];
  pt = -gt.Inverse[ht];
  xnew = xold + pt;
  xold = xnew;
  const = 10 000 - xnew[[1, 1]]^2 - xnew[[1, 2]]^2 / 4;
  norm = Sqrt[gt[[1, 1]]^2 + gt[[1, 2]]^2];
  Print[{norm, const, MatrixForm[gt], MatrixForm[xnew]}}];};
Print[{norm, const, MatrixForm[gt], MatrixForm[xnew]}}];
x1 = xold;

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{51538.1, -330.612, (-49999.4 -12499.6), (90.9088 90.9108)}
{6195.43, -7.81213, (-6010.5 -1502.41), (89.4742 89.4913)}
{143.422, -0.12972, (-139.197 -34.556), (89.3126 89.9641)}
{1.72535, -126.033, (-1.71538 -0.185247), (84.2633 110.013)}
{2233.53, -1.2126, (-2123.33 -692.926), (83.7379 109.347)}
{20.6228, -0.707337, (-19.6406 -6.28888), (83.2886 110.702)}
{11.6722, -1.60241, (-11.1103 -3.57794), (82.5955 112.776)}
{27.2198, -0.295437, (-25.7907 -8.7038), (82.308 113.59)}
{4.39286, -5.04612, (-4.18085 -1.34823), (81.0372 117.269)}
{86.2091, -0.0607988, (-81.089 -29.2673), (80.9528 117.417)}
{0.290496, -24.445, (-0.288138 -0.0369342), (78.0529 125.414)}
{410.452, -0.0915931, (-380.875 -152.987), (77.9561 125.267)}
{0.753777, -0.333519, (-0.702701 -0.272746), (77.6207 126.101)}
{4.80085, -0.0510558, (-4.44907 -1.80389), (77.5801 126.196)}
{0.0674754, -0.0804866, (-0.0632804 -0.0234206), (77.4648 126.48)}
{0.55836, -0.0471559, (-0.516986 -0.210932), (77.4611 126.488)}
{0.000558243, -0.0471276, (-0.00052497 -0.000189847), (77.4598 126.491)}
{0.0000675987, -0.0471236, (-0.0000625872 -0.0000255426), (77.4598 126.491)}
{8.0902 × 10-12, -0.0471236, (-7.61091 × 10-12 -2.74325 × 10-12), (77.4598 126.491)}
{8.0902 × 10-12, -0.0471236, (-7.61091 × 10-12 -2.74325 × 10-12), (77.4598 126.491)}

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In[11]:= l = 2.5;
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gt = gp[xold[[1, 1]], xold[[1, 2]], l];
norm = Sqrt[gt[[1, 1]]^2 + gt[[1, 2]]^2];
While[norm ≥ 0.00001, {gt = gp[xold[[1, 1]], xold[[1, 2]], l];
  ht = hp[xold[[1, 1]], xold[[1, 2]], l];
  pt = -gt.Inverse[ht];
  xnew = xold + pt;
  xold = xnew;
  const = 10000 - xnew[[1, 1]]^2 - xnew[[1, 2]]^2 / 4;
  norm = Sqrt[gt[[1, 1]]^2 + gt[[1, 2]]^2];
  Print[{norm, const, MatrixForm[gt], MatrixForm[xnew]}}];};
Print[{norm, const, MatrixForm[gt], MatrixForm[xnew]}}];
x2 = xold;

{38.638, -0.000942634, (-35.7718 -14.6038), (77.4597 126.491)}
{0.000133826, -0.000942474, (-0.000123899 -0.0000505814), (77.4597 126.491)}
{3.54374 × 10-10, -0.000942474, (3.28087 × 10-10 1.33941 × 10-10), (77.4597 126.491)}
{3.54374 × 10-10, -0.000942474, (3.28087 × 10-10 1.33941 × 10-10), (77.4597 126.491)}

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In[17]:= delta = x2 - x1
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Out[17]= {{-0.000178858, -0.000292075}}
```