Clear all symbols from previous evaluations to avoid problems

In[19]:=
```
Clear["Global`*"]
```

Find a minimum of a given function

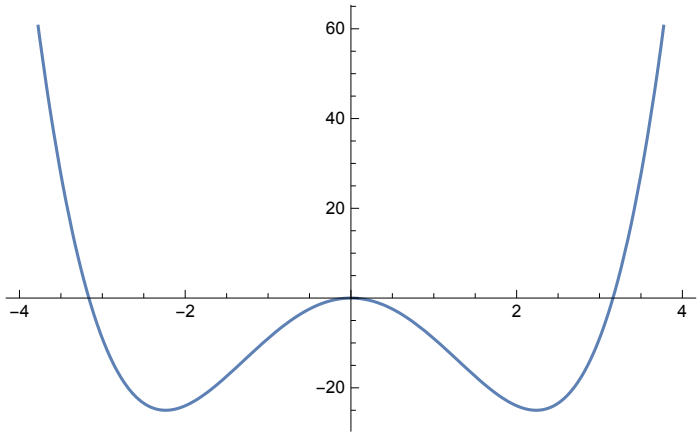
1D function

In[20]:=
```
g[x_] := x^4 - 10 x^2;
Solve[D[g[x], x] == 0, x]
```

Out[21]= $\{\{x \to 0\}, \{x \to -\sqrt{5}\}, \{x \to \sqrt{5}\}\}$

In[22]:=
```
f[x_] := x[[1]]^4 - 10 x[[1]]^2;
Plot[f[{x}], {x, -4, 4}]
{point, value, niter} = MyMinimization[{0.0}, {-0.2}, f, 10^(-10)]
N[{Sqrt[5], g[Sqrt[5]]}]
```

Out[23]=



Out[24]= {{-2.236071777}, -25., 38}

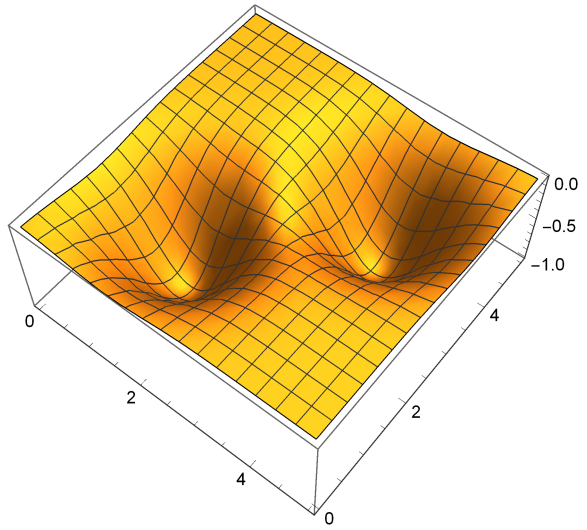
Out[25]= {2.236067977, -25.}

In[26]:=
```
{point, value, niter} // InputForm
```

Out[26]//InputForm=
```
{{-2.236071777343761}, -24.99999999971122, 38}
```

In[27]:=
```
f[x_] := Module[
    {n, i},
    n = Length[x];
    Return[
     -Exp[-Sum[(x[[i]] - 1.5)^2, {i, 1, n}]] - Exp[-Sum[(x[[i]] - 3.5)^2, {i, 1, n}]]]
   ];
Plot3D[f[{x, y}], {x, 0, 5}, {y, 0, 5}]
```

Out[28]=

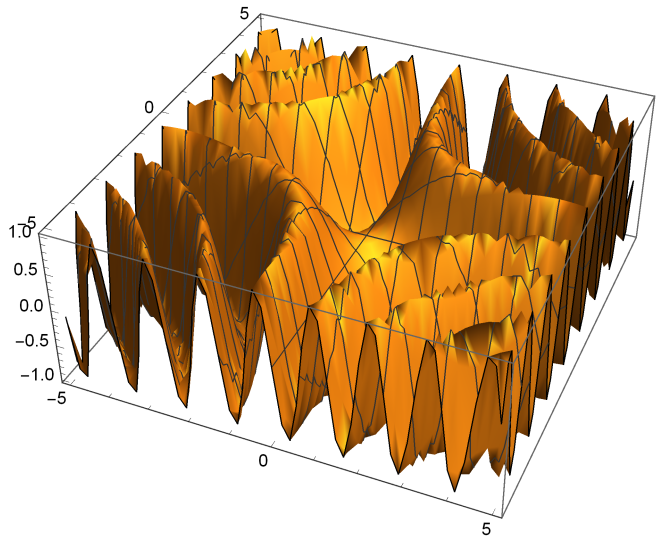


In[29]:=
```
{point, value, niter} = MyMinimization[{4.5, 0.5}, {0.01, 0.01}, f, 10^(-10)]
```

Out[29]= {{1.500676019, 1.500678098}, -1.000336367, 114}

In[30]:=
```
f[x_] := Module[
    {n, i},
    n = Length[x];
    Return[Sin[x[[1]] * x[[2]]]]
   ];
Plot3D[f[{x, y}], {x, -5, 5}, {y, -5, 5}]
```

Out[31]=



In[32]:=
```
{point, value, niter} = MyMinimization[{0.5, 0.1}, {0.1, 0.1}, f, 10^(-8)]
```

Out[32]= {{1.355838185, -1.158516446}, -0.9999999994, 50}

Nonlinear least-square fitting

Fitting a function with noise

In[33]:=
```
myf[x_, p1_, p2_, p3_] := p1 * Exp[-p2 * (x - p3) ^2];
n = 40;
d = 0.1;
grid = Table[0.0 + i * 0.1, {i, 1, n}];
data = Table[myf[grid[[i]], 2.0, 2.0, 2.0] + RandomReal[{-d, d}], {i, 1, n}];
```

In[38]:=
```
f[par_] := Module[
   {i, fx, squares},
   squares = 0.0;
   Do[
    fx = myf[grid[[i]], par[[1]], par[[2]], par[[3]]] - data[[i]];
    squares += fx * fx,
    {i, 1, n}
   ];
   Return[squares]
  ];
{point, value, niter} = MyMinimization[{2.0, 2.0, 2.0}, {0.01, 0.01, 0.01}, f, 10^(-8)]
{point, value, niter} = MyMinimization[{0.0, 0.0, 1.0}, {1.0, 1.0, 1.0}, f, 10^(-8)]
```

Out[39]= {{2.006715073, 1.937825346, 2.002613654}, 0.1157463412, 95}

Out[40]= {{2.006716956, 1.937840457, 2.002613066}, 0.1157463409, 144}

In[41]:=
```
data2 = Table[myf[grid[[i]], 2.0, 2.0, 2.0], {i, 1, n}];
data3 = Table[myf[grid[[i]], Delete[point, 0]], {i, 1, n}];
ListPlot[{Transpose[{grid, data}], Transpose[{grid, data2}],
  Transpose[{grid, data3}]}, Joined → {False, True, True}]
```

Out[43]=