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h = Flatten[Table[x^n y^m, {n, 0, 3}, {m, 0, 3}]];
M = Flatten[Table[{a, b}, {a, 0, 1}, {b, 0, 1}], 1]; M // MatrixForm

$$\begin{pmatrix} 0 & 0 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{pmatrix}$$

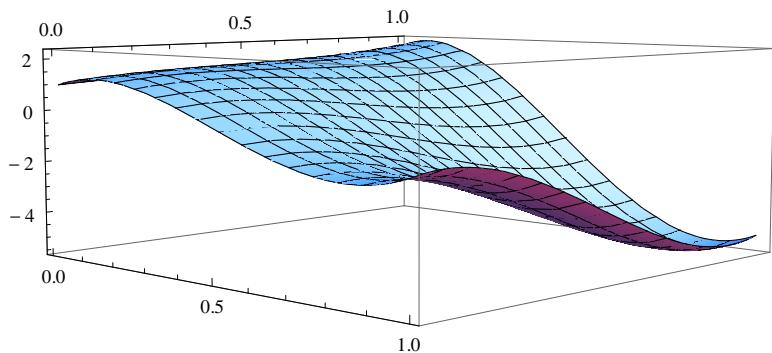
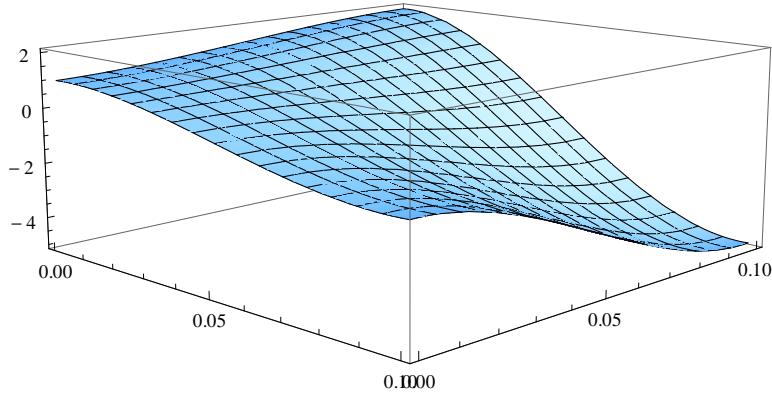
b =.
A[i_, b_] := b^(-(M[[i, 1]] + M[[i, 2]]) * D[D[#, {x, M[[i, 1]]}], {y, M[[i, 2]]}]) &
A[4, b][x x y y]
4 b^2 x y
b =.
Co = Inverse[Transpose[
  Flatten[Table[A[j, b][h] /. x → M[[i, 1]] /. y → M[[i, 2]], {j, 4}, {i, 4}], 1]]];
Co // MatrixForm

$$\begin{pmatrix} 1. & 0. & -3. & 2. & 0. & -4.44089 \times 10^{-16} & 8.88178 \times 10^{-16} & -4.44089 \times 10^{-16} & -3. & 8.88178 \times 10 \\ 0. & 0. & 3. & -2. & 0. & 4.44089 \times 10^{-16} & -8.88178 \times 10^{-16} & 4.44089 \times 10^{-16} & 0. & -8.88178 \times 1 \\ 0. & 0. & 0. & 0. & 0. & 4.44089 \times 10^{-16} & -8.88178 \times 10^{-16} & 4.44089 \times 10^{-16} & 3. & -8.88178 \times 1 \\ 0. & 0. & 0. & 0. & 0. & -4.44089 \times 10^{-16} & 8.88178 \times 10^{-16} & -4.44089 \times 10^{-16} & 0. & 8.88178 \times 10 \\ 0. & 0.1 & -0.2 & 0.1 & 0. & 0. & 0. & 0. & 0. & -0.3 \\ 0. & 0. & -0.1 & 0.1 & 0. & 2.77556 \times 10^{-17} & -2.77556 \times 10^{-17} & 0. & 0. & 0. \\ 0. & 0. & 0. & 0. & 0. & 0. & 0. & 0. & 0. & 0.3 \\ 0. & 0. & 0. & 0. & 0. & -2.77556 \times 10^{-17} & 2.77556 \times 10^{-17} & 0. & 0. & 0. \\ 0. & 0. & 0. & 0. & 0.1 & 0. & -0.3 & 0.2 & -0.2 & 0. \\ 0. & 0. & 0. & 0. & 0. & 0. & 0.3 & -0.2 & 0. & 0. \\ 0. & 0. & 0. & 0. & 0. & 2.77556 \times 10^{-17} & 0. & -2.77556 \times 10^{-17} & -0.1 & -2.77556 \times 1 \\ 0. & 0. & 0. & 0. & 0. & -2.77556 \times 10^{-17} & 0. & 2.77556 \times 10^{-17} & 0. & 2.77556 \times 10 \\ 0. & 0. & 0. & 0. & 0.01 & -0.02 & 0.01 & 0. & 0. & -0.02 \\ 0. & 0. & 0. & 0. & 0. & 1.73472 \times 10^{-18} & -0.01 & 0.01 & 0. & 0. \\ 0. & 0. & 0. & 0. & 0. & 0. & 0. & -1.73472 \times 10^{-18} & 0. & -0.01 \\ 0. & 0. & 0. & 0. & 0. & 1.73472 \times 10^{-18} & -1.73472 \times 10^{-18} & 0. & 1.73472 \times 10 \end{pmatrix}$$

/. x → xx / b /. y → yy / b

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```
s = {1, 2, -1, -5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}; b = 0.1;
Plot3D[s.Co.h /. x → xx / b /. y → yy / b, {xx, 0, b}, {yy, 0, b}]
```



```
g = {x1, x2, x3, x4, dx1, dx2, dx3, dx4, dx5, dx6, dx7, dx8, dx9, dx10, dx11, dx12}.Co.h /.
  x → xx / b /. y → yy / b;
Table[Expand[D[D[g, {xx, M[[i, 1]]}], {yy, M[[i, 2]]}]] /. xx → M[[j, 1]] b /.
  yy → M[[j, 2]] b, {i, 4}, {j, 4}]
{{x1, x2, x3, x4}, {dx1, dx2, dx3, dx4}, {dx5, dx6, dx7, dx8}, {dx9, dx10, dx11, dx12}}
```

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M // MatrixForm
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$$\begin{pmatrix} 0 & 0 \\ 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{pmatrix}$$