

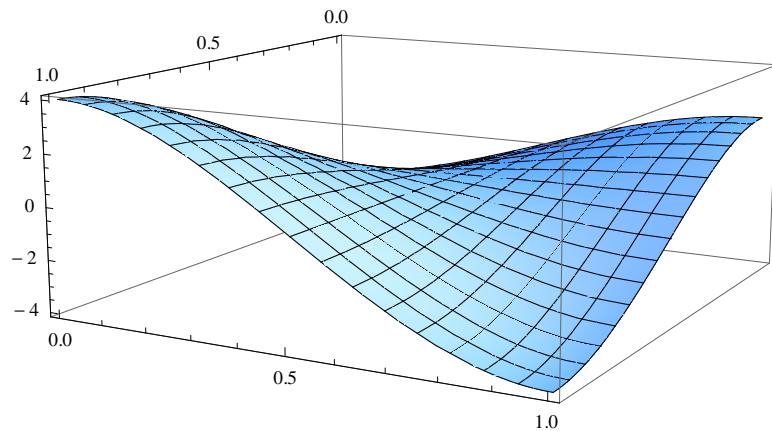
```

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

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

A[i_] := D[D[#, {x, M[[i, 1]]}], {y, M[[i, 2]]}] &
Co = Inverse[Transpose[
  Flatten[Table[A[j][h] /. x → M[[i, 1]] /. y → M[[i, 2]], {j, 4}, {i, 4}], 1]]];
s = {-2, 2, 4, -4}; Plot3D[h.Sum[Co[[i]] * s[[i]], {i, Length[s]}], {x, 0, 1}, {y, 0, 1}]

```

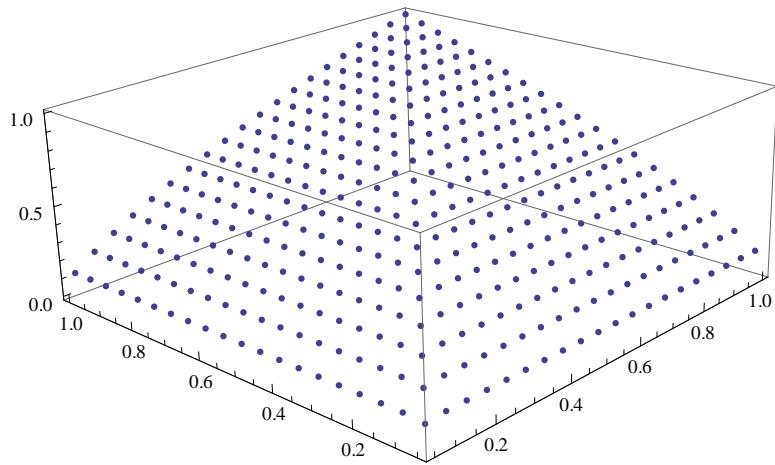


```

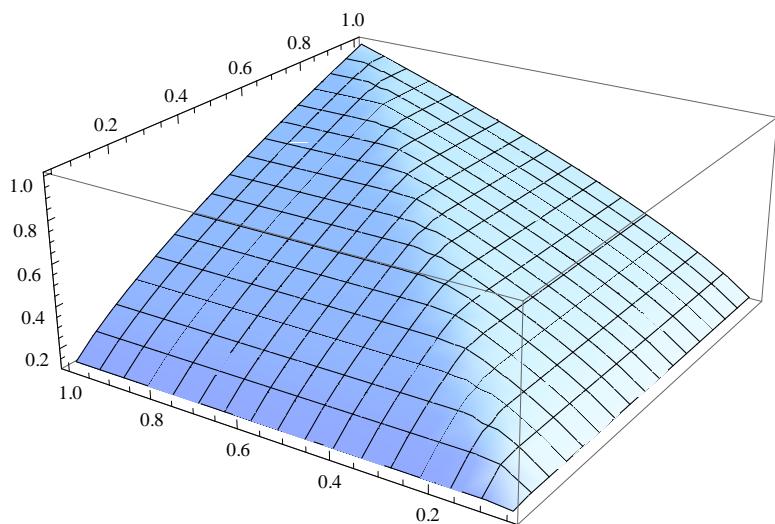
A = 20; nx = 20; ny = 20; of = 0.0001;
M2 = Flatten[Table[Join[{x / nx + of, y / ny + of}, Table[ND[f2[#1, #2, 0.999, A] &,
  i, x / nx + of, y / ny + of], {i, 4}]], {x, nx}, {y, ny}] // N, 1];

```

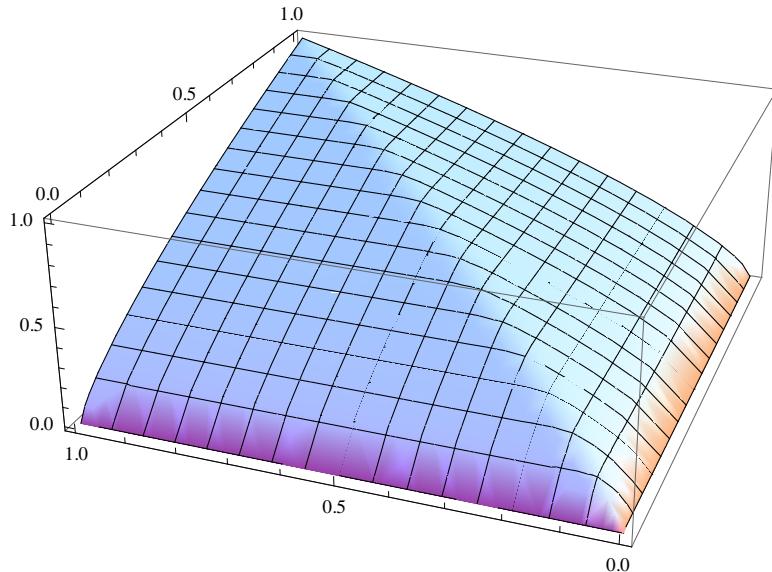
```
ListPointPlot3D [Transpose [Transpose [M2 ][[1 ;; 3]]]]
```



```
ListPlot3D [Transpose [Transpose [M2 ][[1 ;; 3]]]]
```



```
Plot3D[f2[x, y, 0.999, A], {x, 0, 1}, {y, 0, 1}]
```



```
nD[f_, x_] := (f[x + dof] - f[x - dof]) / 2 / dof;
dof = 0.000001; ND[f_, i_, x_, y_] :=
Switch[i, 1, f[x, y], 2, nD[f[#, y] &, x], 3, nD[f[x, #] &, y], 4, - $\frac{1}{4 \text{ dof}^2}$ 
(-f[x - dof, y - dof] + f[x - dof, y + dof] + f[x + dof, y - dof] - f[x + dof, y + dof])];
```

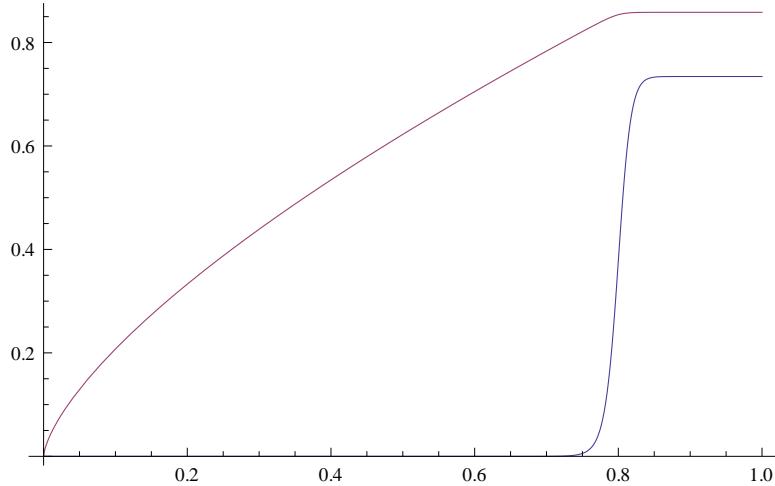
ND

```
ND[f2[#, .9999, 0.999, A] &, 0.2]
1.13539  $\times 10^{-10}$ 
```

```
ND[f2[#1, #2, 0.999, A] &, 2, 1, yy]
nD[(f2[#1, #2, 0.999, A] &) [#1, 0.7] &, 1]
```

```
f2[x_, y_, a_, b_] := Sin[x] Cos[y]
D[D[f2[x, y, 0.999, A], x], y] /. y -> y /. x -> x
-Cos[x] Sin[y]
```

```
yy = 0.8; Plot[{ND[f2[#1, #2, 0.999, a] &, 3, x, yy], f2[x, yy, 0.999, a]}, {x, 0, 1}]
```



```
f2[x, yy, 0.99, a], x /. x → xx
```

FindRoot::nlnum :

The function value  $\left\{ -0.99 + \left( 2.71828^{(\ll 23\gg + \ll 1\gg)^{1/20}} - 1. \ll 1\gg^{1/20} (\ll 1\gg)^{39} \ll 1\gg \ll 2\gg \right) \left( 19. + (\ll 1\gg)^{1/20} \right) \right\}$

is not a list of numbers with dimensions {1} at {z} =  $\{1. \times 10^{-13}\}$ .

```
ND[-0.99, 0.1]
```

```
f2[x, y, z, a]
```

FindRoot::nlnum :

The function value  $\left\{ -1. \times 10^{-13} + \frac{2.71828^{(\ll 1\gg + \ll 1\gg)^{1/a} - 1. \ll 1\gg^{1/a} (\ll 1\gg) \left( \frac{\ll 1\gg}{\ll 1\gg} \right)^2 - \frac{\ll 3\gg}{a}}{-1. + a + (\text{Power}[\ll 2\gg] + \text{Power}[\ll 2\gg])^{1/a}} \right\}$

is not a list of numbers with dimensions {1} at {z} =  $\{1. \times 10^{-13}\}$ .

-z