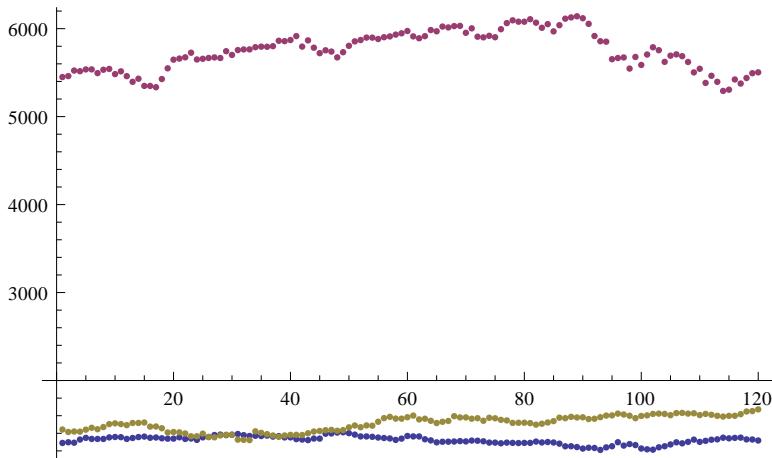
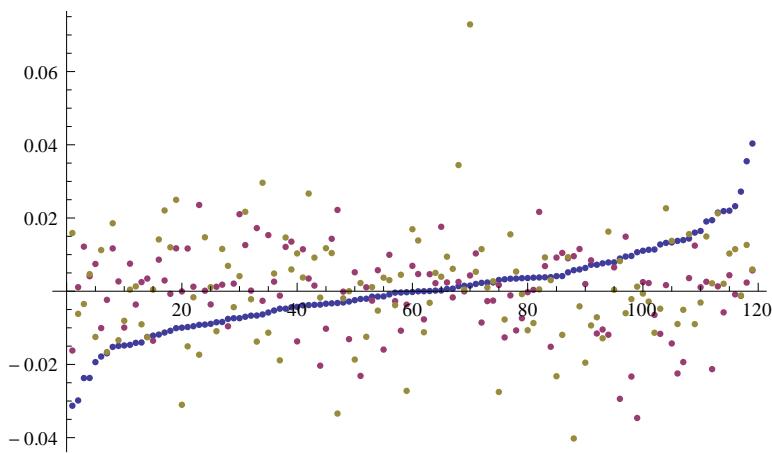


```
{hedge, dax, d2} = Transpose[Import["c:\\kurse.dat", "Table"]];
ListPlot[{hedge, dax, d2}]
```



```
hedge = Log[hedge]; dax = Log[dax]; d2 = Log[d2];
hedge = Differences[hedge];
dax = Differences[dax]; d2 = Differences[d2];
w = Transpose[{hedge, dax, d2}];
w = Sort[w, #1[[1]] < #2[[1]] &];
hedge = Transpose[w][[1]];
dax = Transpose[w][[2]];
d2 = Transpose[w][[3]];
ListPlot[Transpose[w][[1 ;; 3]], PlotRange -> All]
```



```
min0 = Min[Transpose[w][[1]]];
wn = Length[hedge];
nn = wn;
max0 = Max[Transpose[w][[1]]];
min1 = Min[Transpose[w][[2]]];
max1 = Max[Transpose[w][[2]]];
```

```

U = {} ; sdax = Sort[dax] ; AppendTo[U, {max0, max1, 1}] ;

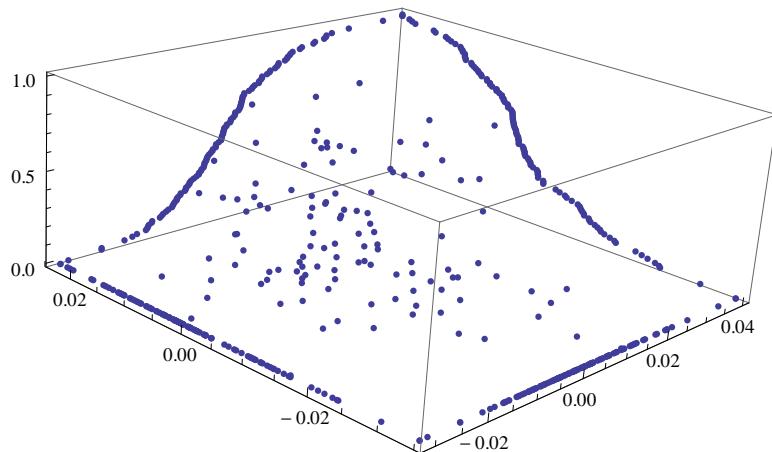
For[i = 1, i ≤ nn, i++,
  AppendTo[U, {hedge[[i]], max1, (i - 1) / nn}] ;
  AppendTo[U, {max0, sdax[[i]], (i - 1) / nn}] ;
  AppendTo[U, {hedge[[i]], min1, 0}] ;
  AppendTo[U, {min0, sdax[[i]], 0}] ;
]

F = {} ; For[i = 1, i ≤ wN, i++,
  AppendTo[F, {w[[i, 1]], w[[i, 2]],
    Length[Select[w, #[[1]] <= w[[i, 1]] && #[[2]] <= w[[i, 2]] &]] / wN}] ;
]

W = Join[F, U] ;

ListPointPlot3D[W]

```

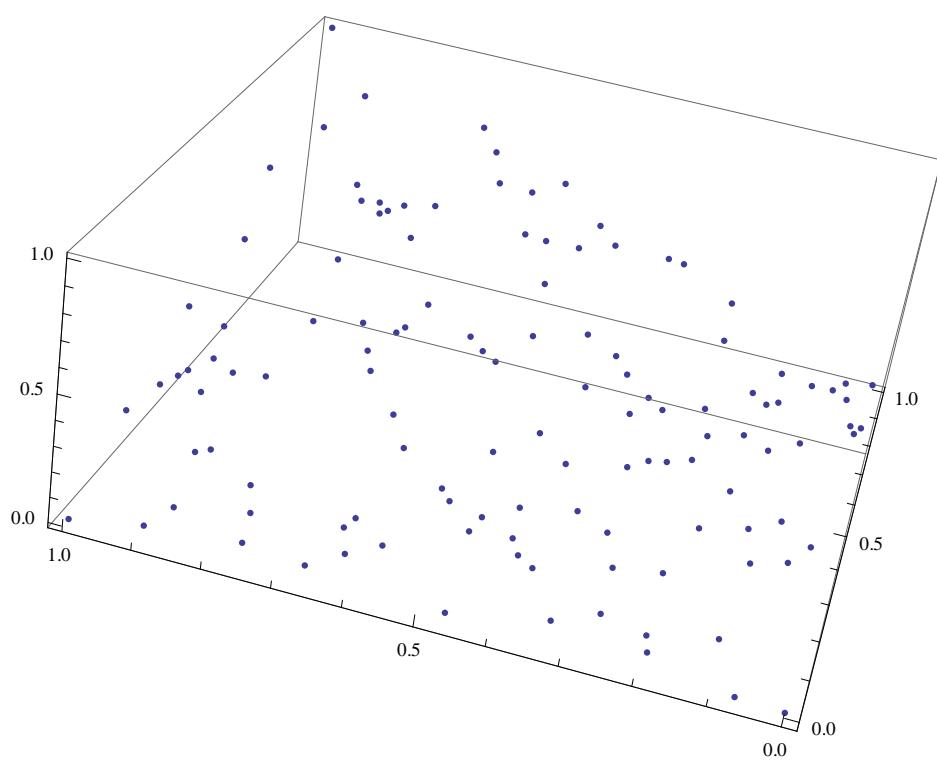


```

hedgeI = Table[{hedge[[i]], (i - 1) / (nn - 1)}, {i, nn}] ;
daxI = Table[{sdax[[i]], (i - 1) / (nn - 1)}, {i, nn}] ; W = F ;
Co = Table[{Select[hedgeI, #[[1]] == W[[i, 1]] &][[1, 2]],
  Select[daxI, #[[1]] == W[[i, 2]] &][[1, 2]], W[[i, 3]]}, {i, Length[W]}] ;
AppendTo[Co, {1, 0, 0}] ; AppendTo[Co, {0, 1, 0}] ; AppendTo[Co, {0, 0, 0}] ;
AppendTo[Co, {1, 1, 1}] ;

```

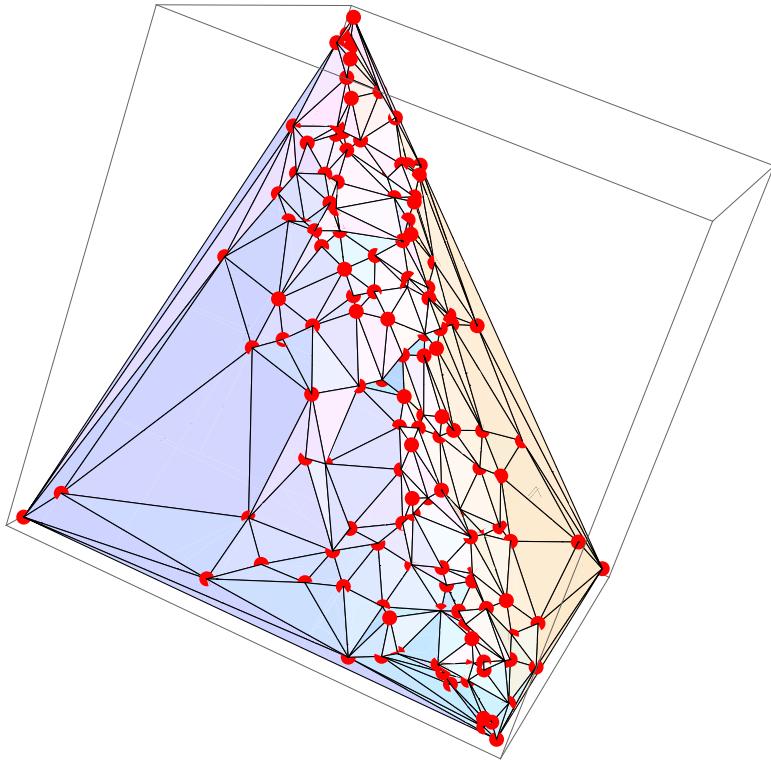
ListPointPlot3D [Co]



```

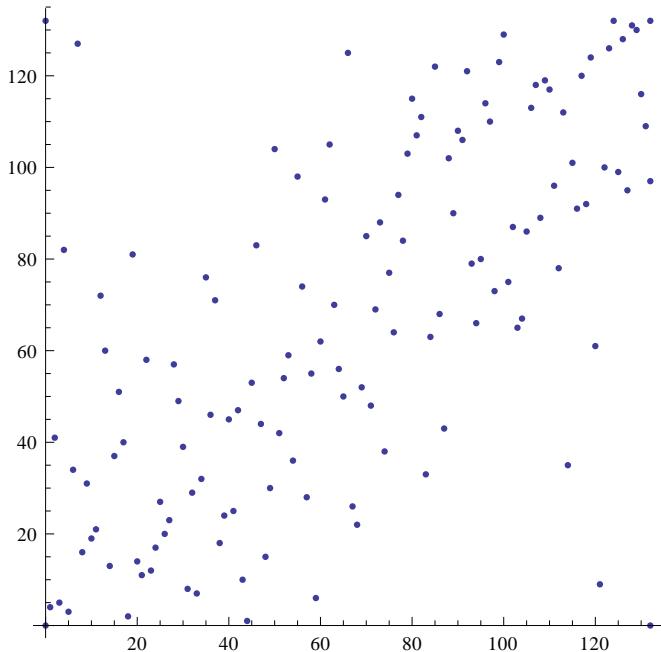
dg = Import["D:\\Dateien\\NetBeansProjects\\HedgeFit\\CopulaDSample.dat", "Table"];
g = Import["D:\\Dateien\\NetBeansProjects\\HedgeFit\\CopulaSample.dat", "Table"];
dbe = Import["D:\\Dateien\\NetBeansProjects\\HedgeFit\\CopulaB.dat", "Table"];
h = Import["D:\\Dateien\\NetBeansProjects\\HedgeFit\\delaunay.dat", "Table"];
cc = Import["D:\\Dateien\\NetBeansProjects\\HedgeFit\\Copula.dat", "Table"];
c = Transpose[{#[[1]], #[[2]], #[[3]]} &[Transpose[cc]]];
cc = Transpose[Transpose[cc][[1 ;; 3]]]; hh = h;
Graphics3D[{{PointSize[Large], Red, Table[Point[c[[i]]], {i, Length[c]}]},
{PointSize[Large], Point[{{107.4, 25, 22.51310344827582}}]}, {Opacity[1], Table[Polygon[c[[# + 1]] & /@ hh[[j]]], {j, Length[hh]}]}}]

```



```
dd = Transpose[Transpose[cc][[1 ;; 2]]];
```

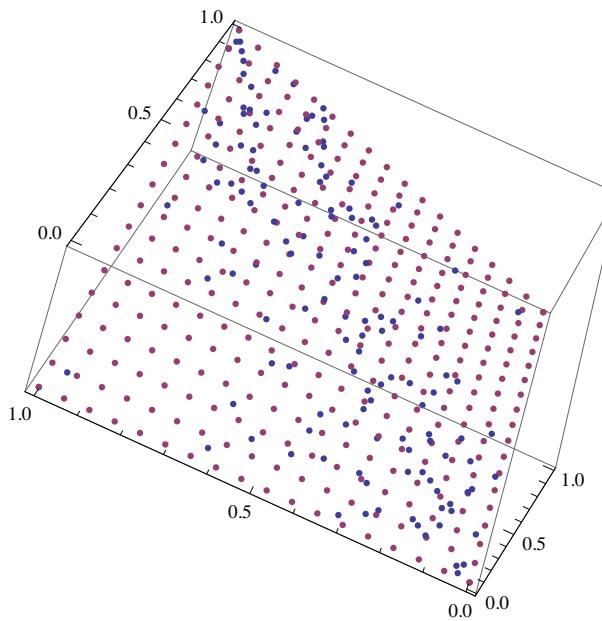
```
ListPlot[dd, AspectRatio -> 1]
```



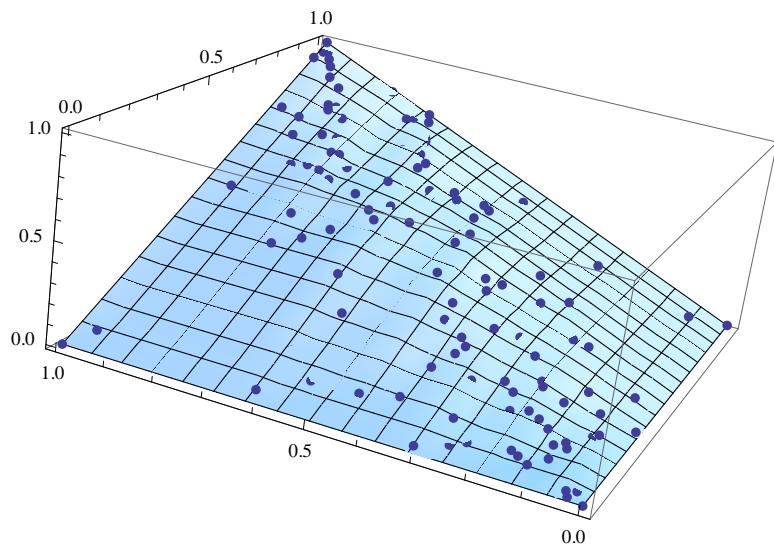
```
dd = {{92, 121}, {107, 118}, {58, 55}, {83, 33}, {18, 2}, {24, 17}, {47, 44}, {85, 122},
{40, 45}, {84, 63}, {100, 129}, {129, 130}, {103, 65}, {60, 62}, {55, 98},
{43, 10}, {45, 53}, {29, 49}, {39, 24}, {49, 30}, {99, 123}, {97, 110}, {114, 35},
{106, 113}, {78, 84}, {68, 22}, {115, 101}, {105, 86}, {38, 18}, {67, 26},
{126, 128}, {89, 90}, {35, 76}, {41, 25}, {59, 6}, {80, 115}, {48, 15}, {91, 106},
{31, 8}, {20, 14}, {5, 3}, {32, 29}, {76, 64}, {123, 126}, {8, 16}, {50, 104},
{26, 20}, {12, 72}, {81, 107}, {96, 114}, {3, 5}, {23, 12}, {7, 127}, {6, 34},
{4, 82}, {1, 4}, {117, 120}, {102, 87}, {93, 79}, {131, 109}, {101, 75}, {120, 61},
{71, 48}, {9, 31}, {98, 73}, {82, 111}, {119, 124}, {56, 74}, {90, 108}, {33, 7},
{73, 88}, {44, 1}, {25, 27}, {113, 112}, {75, 77}, {62, 105}, {74, 38}, {65, 50},
{130, 116}, {128, 131}, {69, 52}, {88, 102}, {53, 59}, {16, 51}, {108, 89}, {132, 97},
{63, 70}, {79, 103}, {70, 85}, {37, 71}, {64, 56}, {125, 99}, {42, 47}, {104, 67},
{86, 68}, {77, 94}, {72, 69}, {27, 23}, {22, 58}, {46, 83}, {57, 28}, {17, 40},
{11, 21}, {127, 95}, {52, 54}, {110, 117}, {112, 78}, {122, 100}, {51, 42},
{116, 91}, {121, 9}, {2, 41}, {15, 37}, {95, 80}, {36, 46}, {19, 81}, {28, 57},
{13, 60}, {87, 43}, {94, 66}, {21, 11}, {34, 32}, {10, 19}, {66, 125}, {14, 13},
{61, 93}, {111, 96}, {54, 36}, {30, 39}, {124, 132}, {118, 92}, {109, 119}};
```

```
wN = Length[dd]; n = Round[Sqrt[wN] * 1.1]; F = {}; For[i = 0, i <= n, i++,
For[j = 0, j <= n, j++,
If[i == 0, AppendTo[F, {i/n, j/n, 0}], If[j == 0, AppendTo[F, {i/n, j/n, 0}], If[i == n,
AppendTo[F, {i/n, j/n, j/n}], If[j == n, AppendTo[F, {i/n, j/n, i/n}],
AppendTo[F, {i/n, j/n, Length[Select[dd,
#[[1]] <= i wN/n && #[[2]] <= j wN/n &]]/wN}]]]]];
iF = Table[F[[((n+1) (i-1) + j, 3]], {i, 1, n+1}, {j, 1, n+1}];
```

```
ListPointPlot3D[{cc / wN, F}]
```

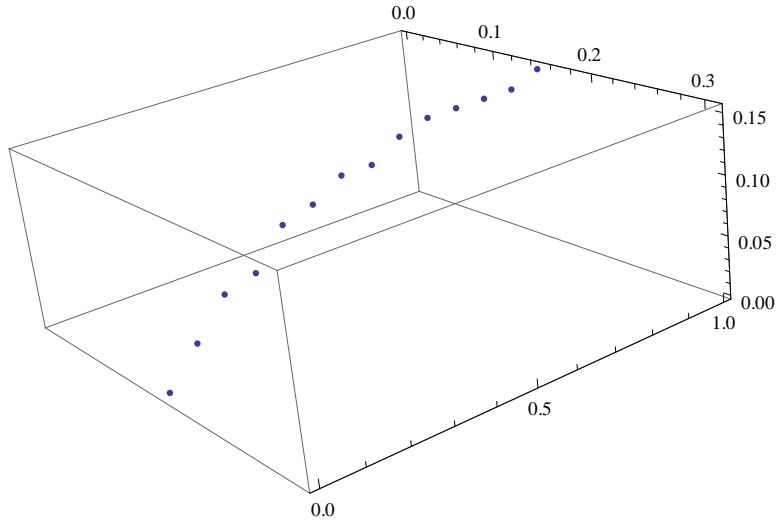


```
Show[ListPointPlot3D[cc / wN, PlotStyle -> PointSize[Medium]], ListPlot3D[F]]
```



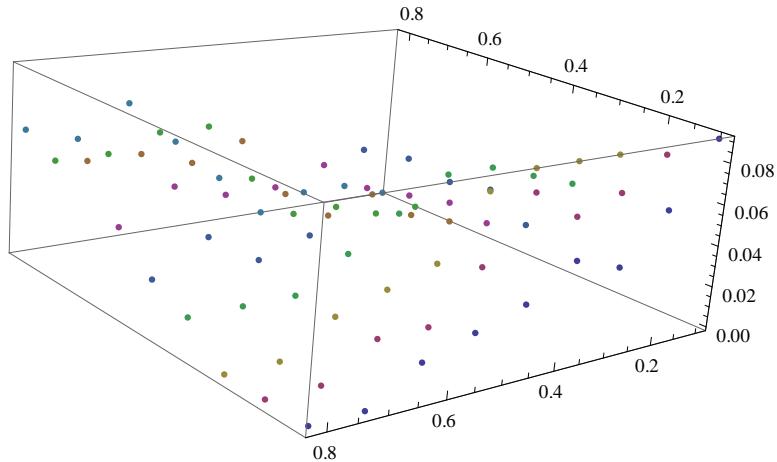
```
iF = Table[{{#[[1]], #[[2]], #[[3]]} &[F[[((n+1) (i-1)+j]]], {i, 1, n+1}, {j, 1, n+1}}];
```

```
ListPointPlot3D[iF[[3]]]
```



```
dF = Table[{iF[[i, j, 1]], iF[[i, j, 2]], iF[[i + 1, j + 1, 3]] + iF[[i - 1, j - 1, 3]] -  
iF[[i + 1, j - 1, 3]] - iF[[i - 1, j + 1, 3]]}, {i, 2, n - 1}, {j, 2, n - 1}];
```

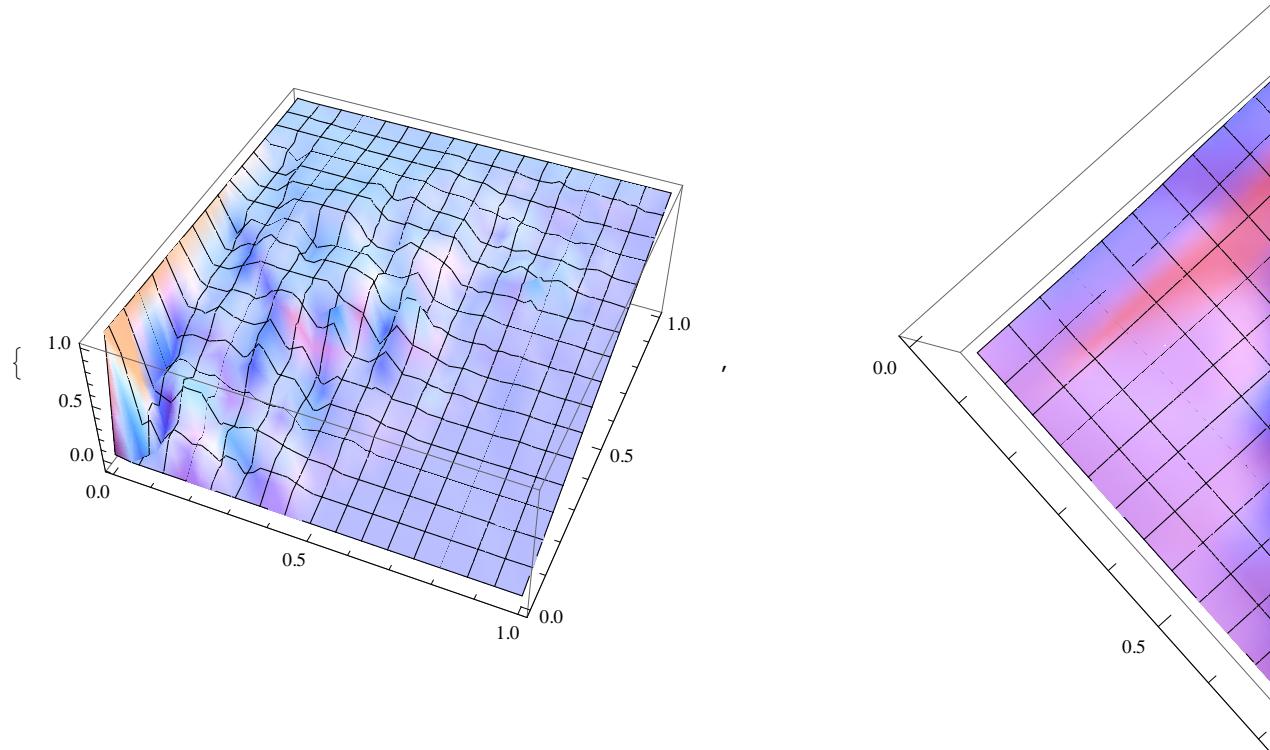
```
ListPointPlot3D[dF]
```



```
G = Table[g[[Sqrt[Length[g]] * (i - 1) + j, 3]],  
{i, Sqrt[Length[g]]}, {j, Sqrt[Length[g]]}];
```

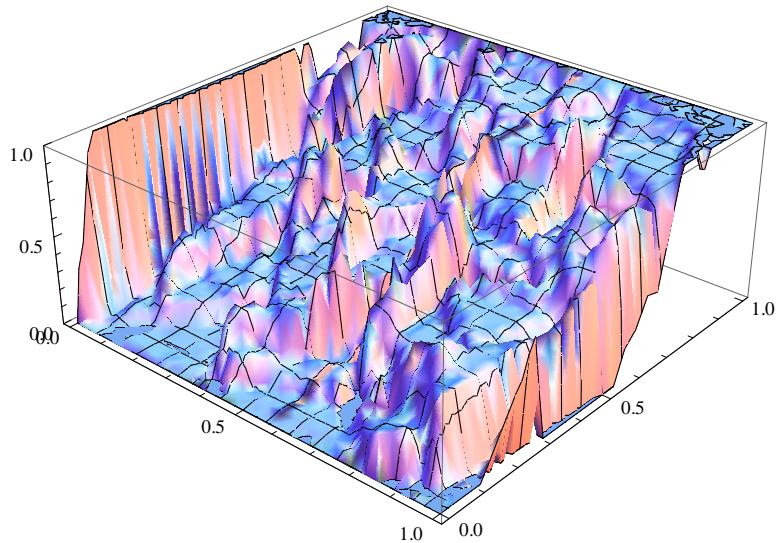
```
B = Table[be[[Sqrt[Length[be]] * (i - 1) + j, 3]],  
{i, Sqrt[Length[be]]}, {j, Sqrt[Length[be]]}];
```

```
{ListPlot3D[{dg}], ListPlot3D[{dbe}]}
```



```
ifun = ListInterpolation[G, {{0, 1}, {0, 1}}, InterpolationOrder -> 5]
InterpolatingFunction[{{0., 1.}, {0., 1.}}, <>]
```

```
Plot3D[D[ifun[xx, y], xx] /. xx -> x, {x, 0, 1}, {y, 0, 1}, PlotRange -> {0, 1}]
```

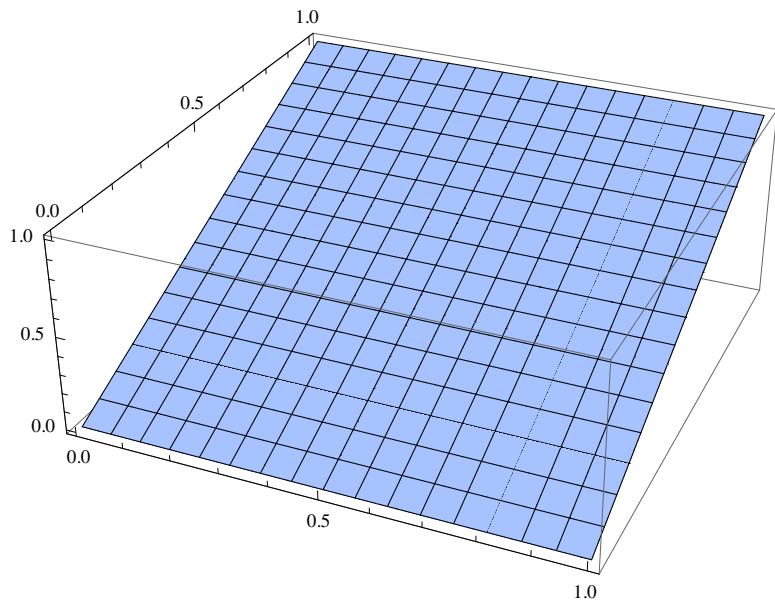


```
f[x_, y_] := x y
```

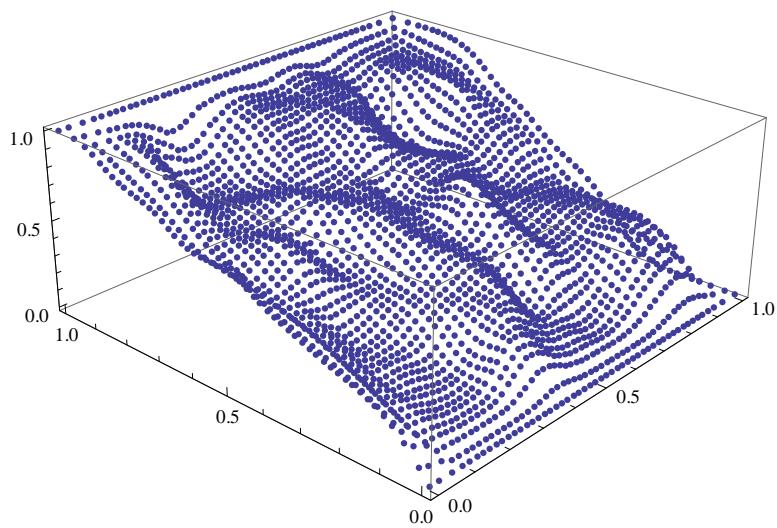
```
y
```

```
Y
```

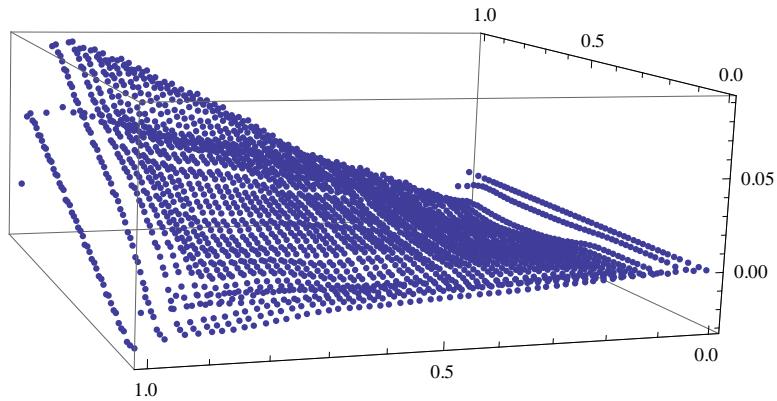
```
Plot3D[D[f[xx, y], xx] /. xx -> x, {x, 0, 1}, {y, 0, 1}]
```



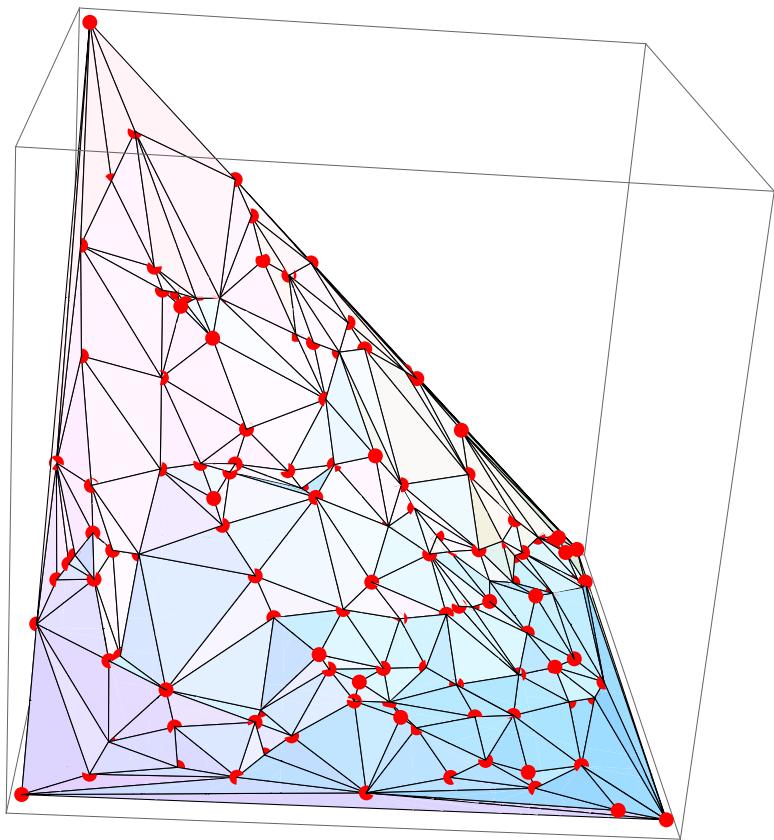
```
ListPointPlot3D [dbe]
```



```
ListPointPlot3D [Table[  
{be[[i, 1]], be[[i, 2]], be[[i, 3]] - ifun[be[[i, 1]], be[[i, 2]]]}, {i, Length[be]}]]
```



```
Show[%, ListPointPlot3D[{{11.9, 23.8, 0}}]]
```



**Length [h]**

240

**h [[123]]**

{26, 34, 78}

**Length [c]**

122

**h**

```
{ {0, 7, 19}, {0, 7, 67}, {0, 12, 57}, {0, 12, 82}, {0, 19, 57}, {0, 24, 66}, {0, 24, 67},  

{0, 32, 66}, {0, 32, 82}, {1, 41, 62}, {1, 41, 100}, {1, 49, 54}, {1, 49, 62}, {1, 54, 76},  

{1, 76, 117}, {1, 100, 117}, {2, 44, 94}, {2, 80, 92}, {2, 80, 101}, {2, 92, 94},  

{2, 94, 121}, {2, 101, 107}, {2, 101, 121}, {3, 12, 57}, {3, 12, 58}, {3, 57, 104},  

{3, 58, 104}, {4, 14, 30}, {4, 14, 37}, {4, 30, 35}, {4, 31, 35}, {4, 31, 71}, {4, 37, 105},  

{4, 53, 71}, {4, 53, 105}, {5, 15, 65}, {5, 15, 115}, {5, 43, 60}, {5, 43, 115}, {5, 60, 65},  

{6, 9, 51}, {6, 9, 117}, {6, 32, 47}, {6, 32, 79}, {6, 47, 117}, {6, 51, 79}, {7, 19, 104},  

{7, 23, 25}, {7, 23, 104}, {7, 25, 34}, {7, 34, 67}, {8, 13, 46}, {8, 13, 111}, {8, 28, 89},  

{8, 28, 115}, {8, 46, 89}, {8, 111, 115}, {9, 51, 76}, {9, 76, 117}, {10, 22, 81},  

{10, 22, 91}, {10, 81, 88}, {10, 88, 91}, {11, 13, 46}, {11, 13, 109}, {11, 42, 102},  

{11, 42, 106}, {11, 46, 89}, {11, 89, 106}, {11, 102, 109}, {12, 44, 58}, {12, 44, 103},  

{12, 69, 82}, {12, 69, 103}, {13, 70, 90}, {13, 70, 111}, {13, 90, 109}, {14, 30, 95},  

{14, 37, 95}, {15, 28, 45}, {15, 28, 115}, {15, 45, 65}, {16, 17, 74}, {16, 17, 99},  

{16, 48, 74}, {16, 48, 99}, {17, 18, 100}, {17, 18, 114}, {17, 27, 74}, {17, 27, 100},  

{17, 97, 99}, {17, 97, 114}, {17, 97, 122}, {17, 114, 122}, {18, 47, 114}, {18, 47, 117},  

{18, 100, 117}, {19, 57, 104}, {20, 30, 95}, {20, 30, 118}, {20, 50, 56}, {20, 50, 95},  

{20, 56, 72}, {20, 72, 118}, {21, 29, 36}, {21, 29, 64}, {21, 36, 47}, {21, 47, 82},  

{21, 64, 82}, {22, 40, 83}, {22, 40, 98}, {22, 40, 119}, {22, 81, 83}, {22, 91, 98},  

{22, 98, 119}, {23, 25, 92}, {23, 92, 94}, {23, 94, 104}, {24, 38, 78}, {24, 38, 86},  

{24, 66, 86}, {24, 67, 78}, {25, 34, 80}, {25, 80, 92}, {26, 28, 34}, {26, 28, 45},  

{26, 34, 78}, {26, 45, 65}, {26, 65, 78}, {27, 41, 48}, {27, 41, 100}, {27, 48, 74},  

{28, 34, 80}, {28, 80, 89}, {29, 36, 75}, {29, 64, 69}, {29, 69, 75}, {30, 35, 118},  

{31, 35, 118}, {31, 52, 55}, {31, 52, 71}, {31, 55, 87}, {31, 87, 118}, {32, 47, 82},  

{32, 66, 79}, {33, 38, 55}, {33, 38, 78}, {33, 52, 55}, {33, 52, 77}, {33, 65, 77},  

{33, 65, 78}, {34, 67, 78}, {36, 47, 114}, {36, 75, 114}, {37, 63, 88}, {37, 63, 95},  

{37, 88, 105}, {38, 51, 76}, {38, 51, 86}, {38, 54, 55}, {38, 54, 76}, {39, 49, 56},  

{39, 49, 116}, {39, 56, 61}, {39, 61, 108}, {39, 108, 116}, {40, 68, 83}, {40, 68, 90},  

{40, 90, 98}, {40, 90, 119}, {41, 48, 62}, {42, 96, 102}, {42, 96, 112}, {42, 101, 106},  

{42, 101, 107}, {42, 107, 112}, {43, 59, 60}, {43, 59, 68}, {43, 68, 70}, {43, 70, 111},  

{43, 111, 115}, {44, 58, 94}, {44, 94, 121}, {44, 103, 122}, {48, 62, 84}, {48, 84, 97},  

{48, 97, 99}, {49, 54, 113}, {49, 56, 72}, {49, 62, 84}, {49, 72, 113}, {49, 84, 116},  

{50, 56, 61}, {50, 61, 95}, {51, 79, 86}, {52, 71, 77}, {53, 59, 77}, {53, 59, 81},  

{53, 71, 77}, {53, 81, 105}, {54, 55, 113}, {55, 87, 113}, {58, 94, 104}, {59, 60, 73},  

{59, 68, 83}, {59, 73, 77}, {59, 81, 83}, {60, 65, 73}, {61, 85, 95}, {61, 85, 108},  

{61, 85, 120}, {61, 95, 120}, {63, 88, 91}, {63, 91, 95}, {64, 69, 82}, {65, 73, 77},  

{66, 79, 86}, {68, 70, 90}, {69, 75, 103}, {72, 87, 113}, {72, 87, 118}, {75, 103, 110},  

{75, 110, 114}, {80, 89, 106}, {80, 101, 106}, {81, 88, 105}, {84, 97, 116}, {85, 95, 98},  

{85, 95, 119}, {85, 97, 116}, {85, 97, 120}, {85, 108, 116}, {85, 116, 120}, {90, 93, 109},  

{90, 93, 119}, {91, 95, 98}, {93, 96, 102}, {93, 96, 107}, {93, 96, 121}, {93, 102, 109},  

{93, 119, 121}, {95, 98, 119}, {95, 98, 120}, {95, 119, 120}, {96, 107, 112},  

{96, 107, 121}, {97, 116, 120}, {101, 107, 121}, {103, 110, 122}, {110, 114, 122} }
```

**ce = c[[3;;7]];**

```

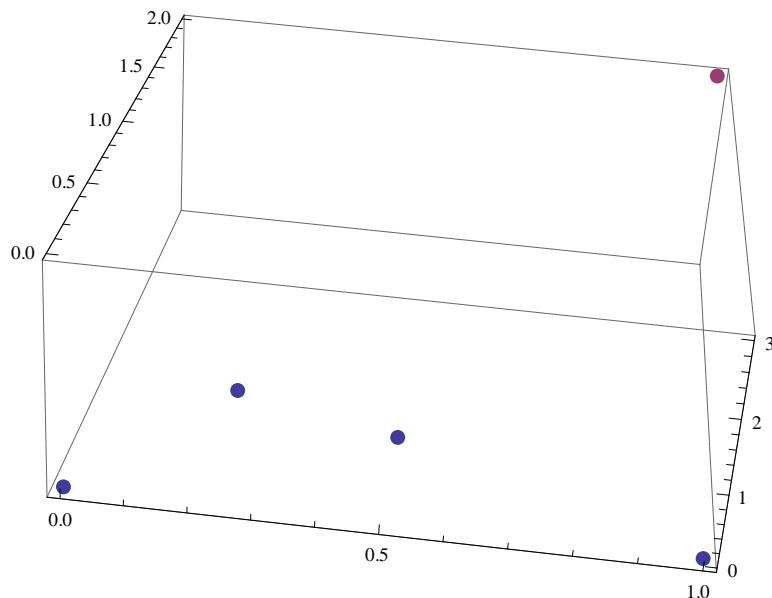
ce = {{0.23564142713114022` , 0.19380998628864599` , 0.594495511815069`},
{0.6525572153791819` , 0.24694329925782044` , 0.7672917678839029`},
{0.9163123444125463` , 0.026621532304647255` , 0.3715576391209683`},
{0.2668950744537262` , 0.7975001767040044` , 0.7934023887167383`},
{0.7641225411392012` , 0.2966207983489944` , 0.1456840182999719`}},

{{0.235641 , 0.19381 , 0.594496} ,
{0.652557 , 0.246943 , 0.767292} , {0.916312 , 0.0266215 , 0.371558} ,
{0.266895 , 0.7975 , 0.793402} , {0.764123 , 0.296621 , 0.145684}}}

{{0.23564142713114022` , 0.19380998628864599` , 0.594495511815069`},
{0.6525572153791819` , 0.24694329925782044` , 0.7672917678839029`},
{0.3163123444125463` , 0.026621532304647255` , 0.3715576391209683`},
{0.2668950744537262` , 0.7975001767040044` , 0.7934023887167383`},
{0.7641225411392012` , 0.8966207983489944` , 0.1456840182999719`}};

ListPointPlot3D[{ce, {a}}, PlotStyle -> PointSize[Large]]

```

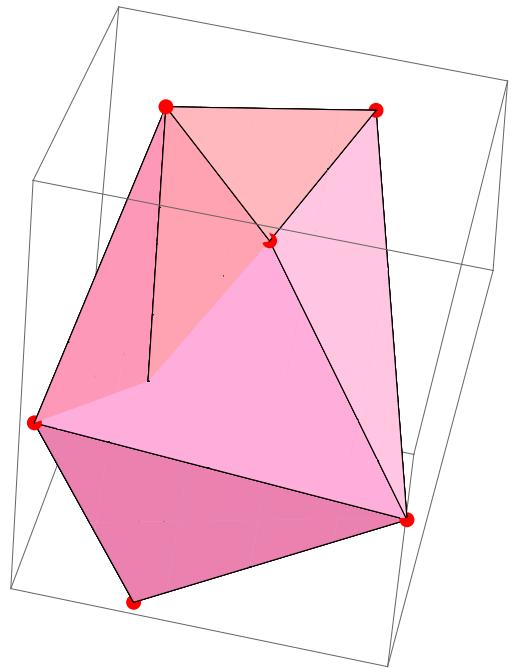


```

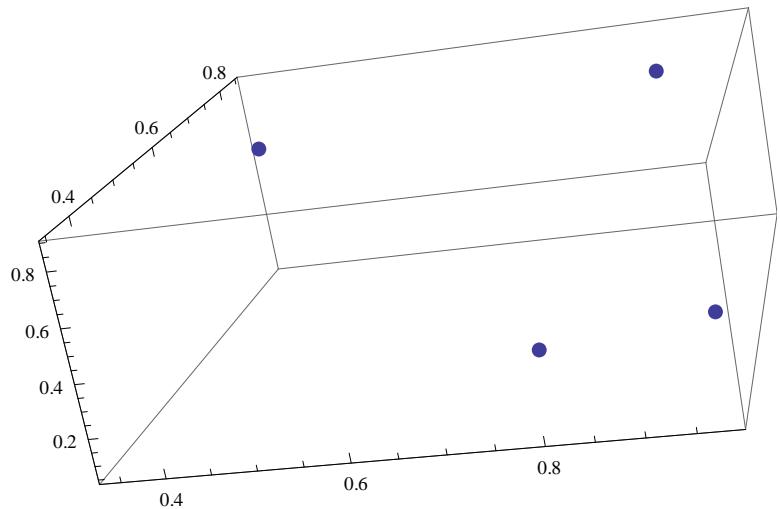
a = {1, 2, 3};

Det [
Export ["c:\\empCopula.dat", RandomReal [1, {7, 4}]]
c:\\empCopula.dat

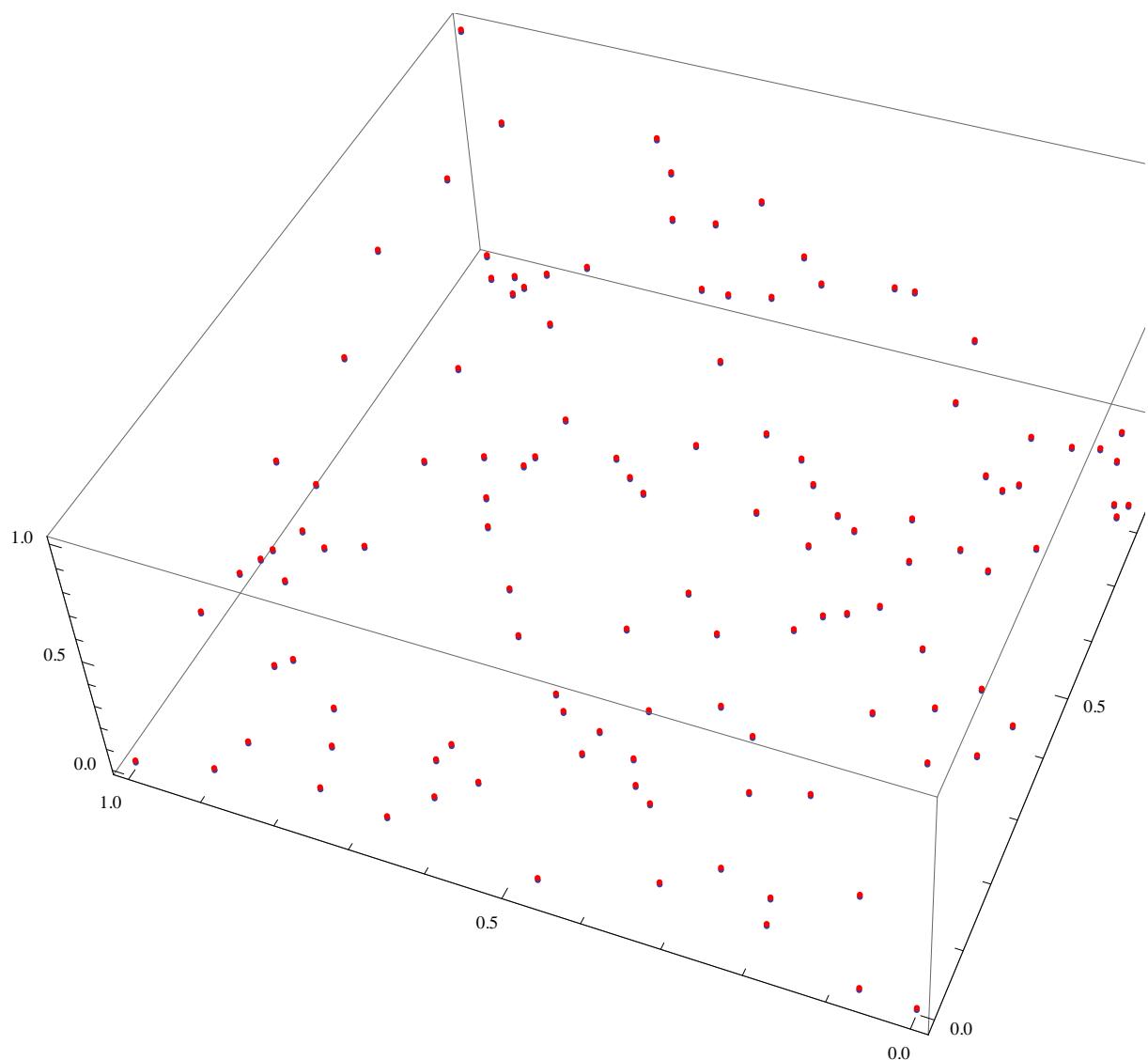
```



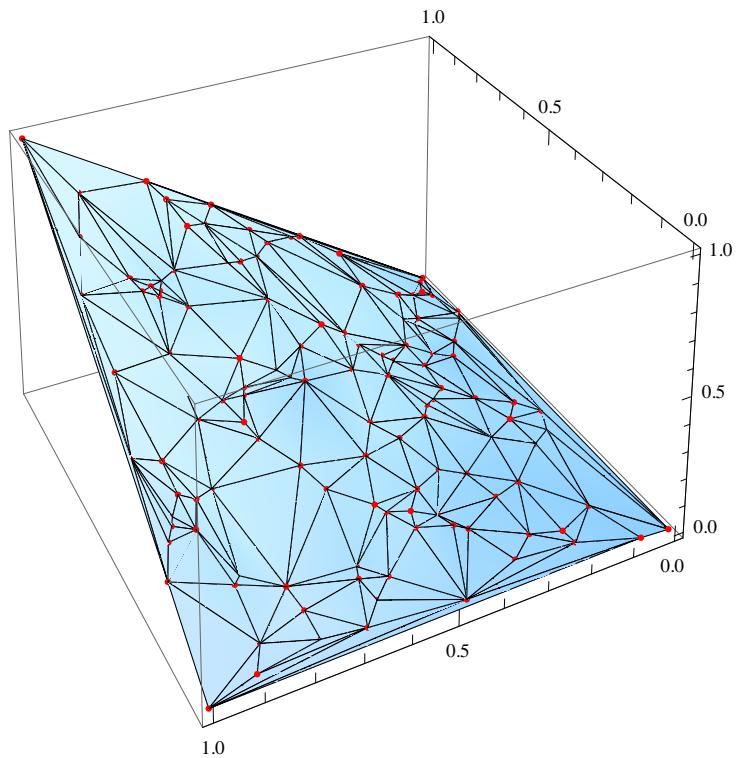
```
ListPointPlot3D[cc, PlotStyle -> PointSize[Large]]
```



```
Show[ListPointPlot3D[{#[[1]], #[[2]], #[[3]] + 0.01} & /@ c, PlotStyle -> Red],  
ListPointPlot3D[Co]]
```



```
Show[ListPlot3D[c, Mesh -> All], ListPointPlot3D[c, PlotStyle -> Red], AspectRatio -> 1]
```



**Y = .**

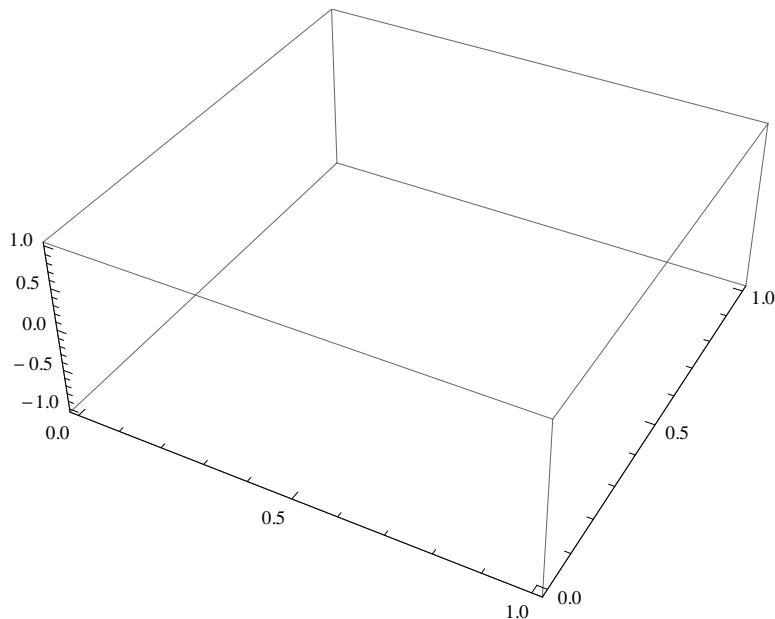
```
Plot3D[Interpolation[c][x, y], {x, 0, 1}, {y, 0, 1}]
```

Interpolation::indim: The coordinates do not lie on a structured tensor product grid.

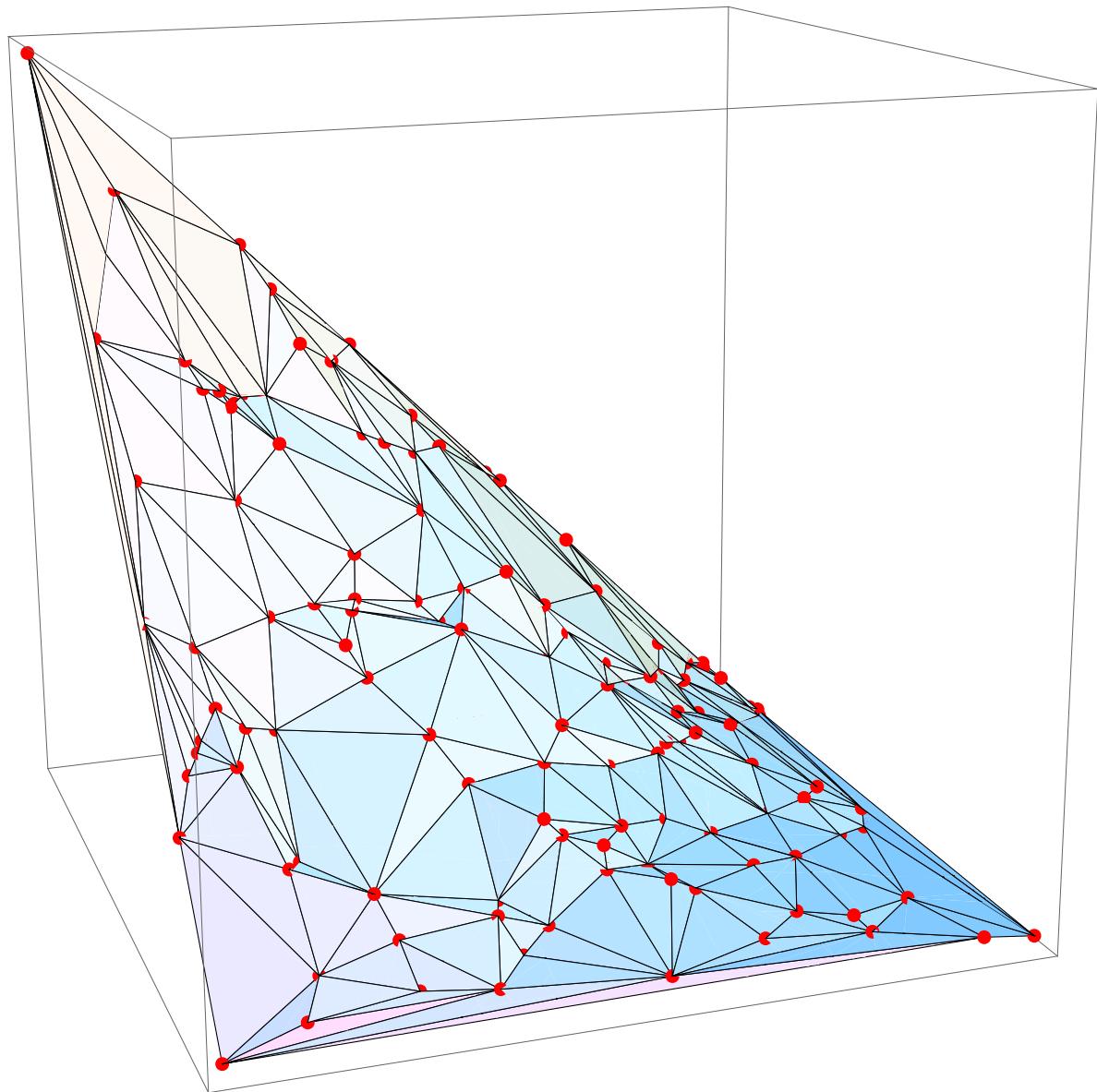
Interpolation::indim: The coordinates do not lie on a structured tensor product grid.

Interpolation::indim: The coordinates do not lie on a structured tensor product grid.

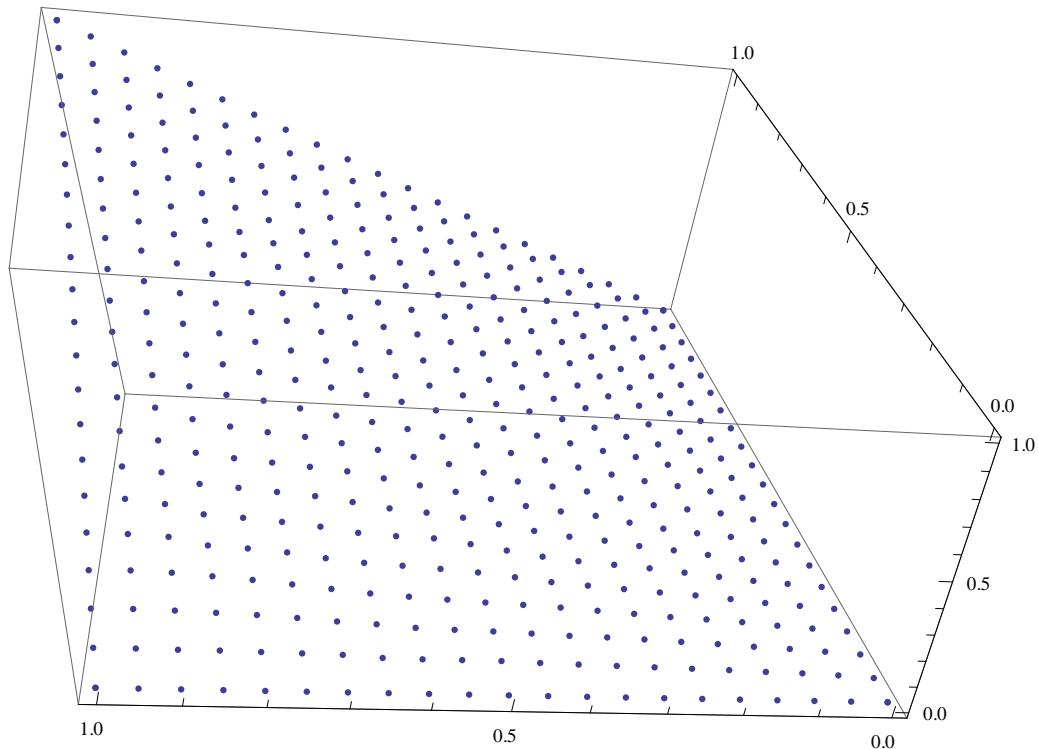
General::stop : Further output of Interpolation::indim will be suppressed during this calculation. >>



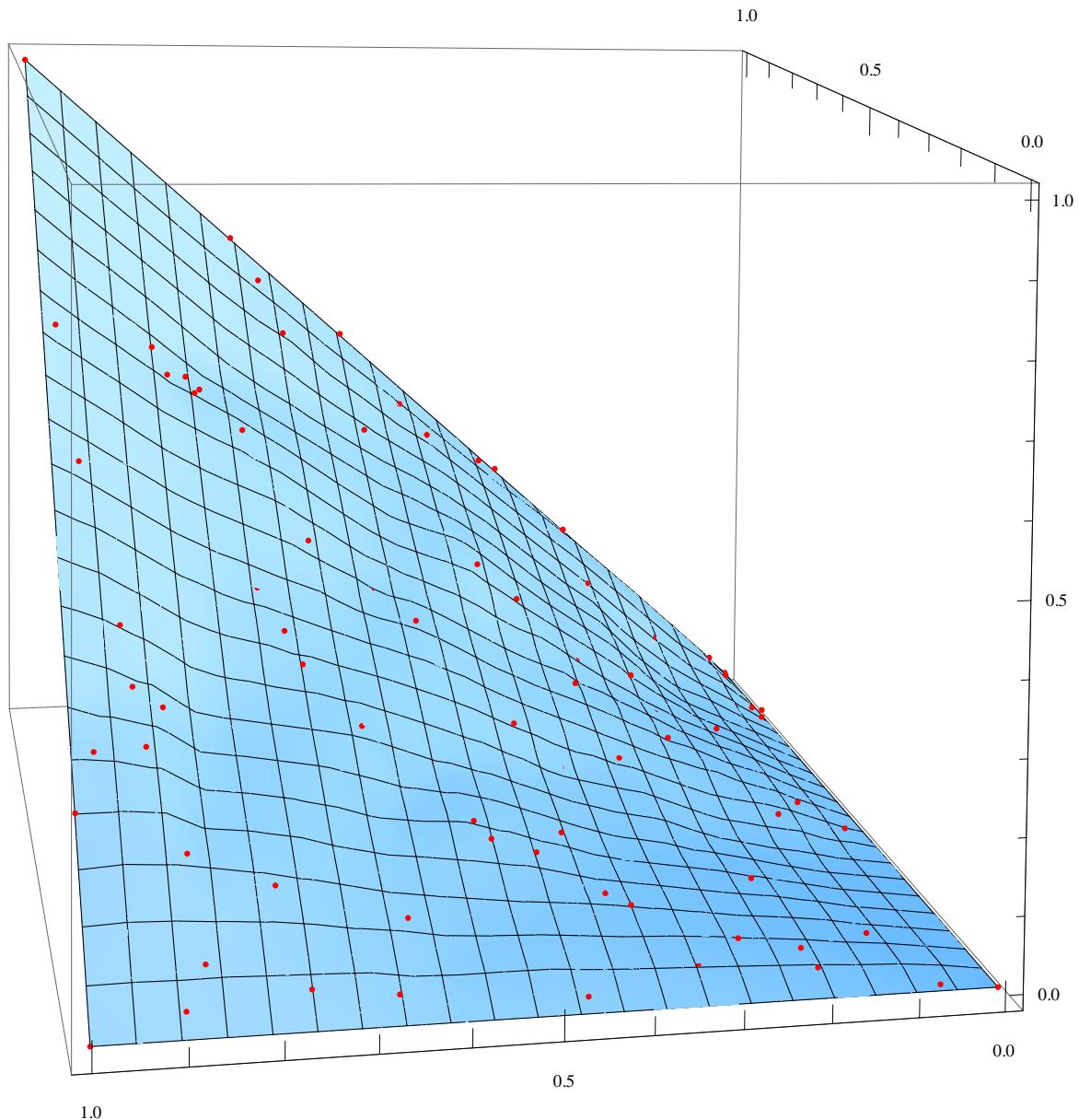
```
Graphics3D[{{PointSize[Large], Red, Table[Point[c[[i]]], {i, Length[c]}]},  
{Table[Polygon[c[[# + 1]] & /@ h[[j]]], {j, Length[h]}]}}]
```



```
ListPointPlot3D[{g}]
```



```
Show[ListPointPlot3D[c, PlotStyle -> Red],  
ListPlot3D[g, InterpolationOrder -> 1, Mesh -> {20, 20}], AspectRatio -> 1]
```



```

f[i_] := {C[i][0], C[i][1], C[i][2], C[i][0]^2 + C[i][1]^2 + C[i][2]^2};
Det[{f[h], f[i], f[j], f[k]}]

C[h][2] C[i][1] C[j][0]^2 C[k][0] - C[h][1] C[i][2] C[j][0]^2 C[k][0] -
C[h][2] C[i][0]^2 C[j][1] C[k][0] - C[h][2] C[i][1]^2 C[j][1] C[k][0] +
C[h][0]^2 C[i][2] C[j][1] C[k][0] + C[h][1]^2 C[i][2] C[j][1] C[k][0] +
C[h][2]^2 C[i][2] C[j][1] C[k][0] - C[h][2] C[i][2]^2 C[j][1] C[k][0] +
C[h][2] C[i][1] C[j][1]^2 C[k][0] - C[h][1] C[i][2] C[j][1]^2 C[k][0] +
C[h][1] C[i][0]^2 C[j][2] C[k][0] - C[h][0]^2 C[i][1] C[j][2] C[k][0] -
C[h][1]^2 C[i][1] C[j][2] C[k][0] - C[h][2]^2 C[i][1] C[j][2] C[k][0] +
C[h][1] C[i][1]^2 C[j][2] C[k][0] + C[h][1] C[i][2]^2 C[j][2] C[k][0] +
C[h][2] C[i][1] C[j][2]^2 C[k][0] - C[h][1] C[i][2] C[j][2]^2 C[k][0] -
C[h][2] C[i][1] C[j][0] C[k][0]^2 + C[h][1] C[i][2] C[j][0] C[k][0]^2 +
C[h][2] C[i][0] C[j][1] C[k][0]^2 - C[h][0] C[i][2] C[j][1] C[k][0]^2 -
C[h][1] C[i][0] C[j][2] C[k][0]^2 + C[h][0] C[i][1] C[j][2] C[k][0]^2 +
C[h][2] C[i][0]^2 C[j][0] C[k][1] + C[h][2] C[i][1]^2 C[j][0] C[k][1] -
C[h][0]^2 C[i][2] C[j][0] C[k][1] - C[h][1]^2 C[i][2] C[j][0] C[k][1] -
C[h][2]^2 C[i][2] C[j][0] C[k][1] + C[h][2] C[i][2]^2 C[j][0] C[k][1] -
C[h][2] C[i][0] C[j][0] C[k][1] + C[h][0] C[i][2] C[j][0] C[k][1]^2 -
C[h][2] C[i][0] C[j][1]^2 C[k][1] + C[h][0] C[i][2] C[j][1]^2 C[k][1] +
C[h][0]^2 C[i][0] C[j][2] C[k][1] + C[h][1]^2 C[i][0] C[j][2] C[k][1] +
C[h][2]^2 C[i][0] C[j][2] C[k][1] - C[h][0] C[i][0]^2 C[j][2] C[k][1] -
C[h][0] C[i][1]^2 C[j][2] C[k][1] - C[h][0] C[i][2]^2 C[j][2] C[k][1] -
C[h][2] C[i][0] C[j][2]^2 C[k][1] + C[h][0] C[i][2] C[j][2]^2 C[k][1] -
C[h][2] C[i][1] C[j][0] C[k][1]^2 + C[h][1] C[i][2] C[j][0] C[k][1]^2 +
C[h][2] C[i][0] C[j][1] C[k][1]^2 - C[h][0] C[i][2] C[j][1] C[k][1]^2 -
C[h][1] C[i][0] C[j][2] C[k][1]^2 + C[h][0] C[i][1] C[j][2] C[k][1]^2 -
C[h][1] C[i][0]^2 C[j][0] C[k][2] + C[h][0]^2 C[i][1] C[j][0] C[k][2] +
C[h][1]^2 C[i][1] C[j][0] C[k][2] + C[h][2]^2 C[i][1] C[j][0] C[k][2] -
C[h][1] C[i][1]^2 C[j][0] C[k][2] - C[h][1] C[i][2]^2 C[j][0] C[k][2] +
C[h][1] C[i][0] C[j][0]^2 C[k][2] - C[h][0] C[i][1] C[j][0]^2 C[k][2] -
C[h][0]^2 C[i][0] C[j][1] C[k][2] - C[h][1]^2 C[i][0] C[j][1] C[k][2] -
C[h][2]^2 C[i][0] C[j][1] C[k][2] + C[h][0] C[i][0]^2 C[j][1] C[k][2] +
C[h][0] C[i][1]^2 C[j][1] C[k][2] + C[h][0] C[i][2]^2 C[j][1] C[k][2] +
C[h][1] C[i][0] C[j][1]^2 C[k][2] - C[h][0] C[i][1] C[j][1]^2 C[k][2] +
C[h][1] C[i][0] C[j][2]^2 C[k][2] - C[h][0] C[i][1] C[j][2]^2 C[k][2] -
C[h][2] C[i][1] C[j][0] C[k][2]^2 + C[h][1] C[i][2] C[j][0] C[k][2]^2 +
C[h][2] C[i][0] C[j][1] C[k][2]^2 - C[h][0] C[i][2] C[j][1] C[k][2]^2 -
C[h][1] C[i][0] C[j][2] C[k][2]^2 + C[h][0] C[i][1] C[j][2] C[k][2]^2

```

**CForm [Expand [%]]**

```

C(h)(2)*C(i)(1)*Power(C(j)(0),2)*C(k)(0) - C(h)(1)*C(i)(2)*Power(C(j)(0),2)*C(k)(0) - C(h)
C(h)(2)*Power(C(i)(1),2)*C(j)(1)*C(k)(0) + Power(C(h)(0),2)*C(i)(2)*C(j)(1)*C(k)(0) +
Power(C(h)(1),2)*C(i)(2)*C(j)(1)*C(k)(0) + Power(C(h)(2),2)*C(i)(2)*C(j)(1)*C(k)(0) -
C(h)(2)*Power(C(i)(2),2)*C(j)(1)*C(k)(0) + C(h)(2)*C(i)(1)*Power(C(j)(1),2)*C(k)(0) -
C(h)(1)*C(i)(2)*Power(C(j)(1),2)*C(k)(0) + C(h)(1)*Power(C(i)(0),2)*C(j)(2)*C(k)(0) -
Power(C(h)(0),2)*C(i)(1)*C(j)(2)*C(k)(0) - Power(C(h)(1),2)*C(i)(1)*C(j)(2)*C(k)(0) -
Power(C(h)(2),2)*C(i)(1)*C(j)(2)*C(k)(0) + C(h)(1)*Power(C(i)(1),2)*C(j)(2)*C(k)(0) +
C(h)(1)*Power(C(i)(2),2)*C(j)(2)*C(k)(0) + C(h)(2)*C(i)(1)*Power(C(j)(2),2)*C(k)(0) -
C(h)(1)*C(i)(2)*Power(C(j)(2),2)*C(k)(0) - C(h)(2)*C(i)(1)*C(j)(0)*Power(C(k)(0),2) +
C(h)(1)*C(i)(2)*C(j)(0)*Power(C(k)(0),2) + C(h)(2)*C(i)(0)*C(j)(1)*Power(C(k)(0),2) -
C(h)(0)*C(i)(2)*C(j)(1)*Power(C(k)(0),2) - C(h)(1)*C(i)(0)*C(j)(2)*Power(C(k)(0),2) +
C(h)(0)*C(i)(1)*C(j)(2)*Power(C(k)(0),2) + C(h)(2)*Power(C(i)(0),2)*C(j)(0)*C(k)(1) +
C(h)(2)*Power(C(i)(1),2)*C(j)(0)*C(k)(1) - Power(C(h)(0),2)*C(i)(2)*C(j)(0)*C(k)(1) -
Power(C(h)(1),2)*C(i)(2)*C(j)(0)*C(k)(1) - Power(C(h)(2),2)*C(i)(2)*C(j)(0)*C(k)(1) +
C(h)(2)*Power(C(i)(2),2)*C(j)(0)*C(k)(1) - C(h)(2)*C(i)(0)*Power(C(j)(0),2)*C(k)(1) +
C(h)(0)*C(i)(2)*Power(C(j)(0),2)*C(k)(1) - C(h)(2)*C(i)(0)*Power(C(j)(1),2)*C(k)(1) +
C(h)(0)*C(i)(2)*Power(C(j)(1),2)*C(k)(1) + Power(C(h)(0),2)*C(i)(0)*C(j)(2)*C(k)(1) +
Power(C(h)(1),2)*C(i)(0)*C(j)(2)*C(k)(1) + Power(C(h)(2),2)*C(i)(0)*C(j)(2)*C(k)(1) -
C(h)(0)*Power(C(i)(0),2)*C(j)(2)*C(k)(1) - C(h)(0)*Power(C(i)(1),2)*C(j)(2)*C(k)(1) -
C(h)(0)*Power(C(i)(2),2)*C(j)(2)*C(k)(1) - C(h)(2)*C(i)(0)*Power(C(j)(2),2)*C(k)(1) +
C(h)(0)*C(i)(2)*Power(C(j)(2),2)*C(k)(1) - C(h)(2)*C(i)(1)*C(j)(0)*Power(C(k)(1),2) +
C(h)(1)*C(i)(2)*C(j)(0)*Power(C(k)(1),2) + C(h)(2)*C(i)(0)*C(j)(1)*Power(C(k)(1),2) -
C(h)(0)*C(i)(2)*C(j)(1)*Power(C(k)(1),2) - C(h)(1)*C(i)(0)*C(j)(2)*Power(C(k)(1),2) +
C(h)(0)*C(i)(1)*C(j)(2)*Power(C(k)(1),2) - C(h)(1)*Power(C(i)(0),2)*C(j)(0)*C(k)(2) +
Power(C(h)(0),2)*C(i)(1)*C(j)(0)*C(k)(2) + Power(C(h)(1),2)*C(i)(1)*C(j)(0)*C(k)(2) +
Power(C(h)(2),2)*C(i)(1)*C(j)(0)*C(k)(2) - C(h)(1)*Power(C(i)(1),2)*C(j)(0)*C(k)(2) -
C(h)(1)*Power(C(i)(2),2)*C(j)(0)*C(k)(2) + C(h)(1)*C(i)(0)*Power(C(j)(0),2)*C(k)(2) -
C(h)(0)*C(i)(1)*Power(C(j)(0),2)*C(k)(2) - Power(C(h)(0),2)*C(i)(0)*C(j)(1)*C(k)(2) -
Power(C(h)(1),2)*C(i)(0)*C(j)(1)*C(k)(2) - Power(C(h)(2),2)*C(i)(0)*C(j)(1)*C(k)(2) +
C(h)(0)*Power(C(i)(0),2)*C(j)(1)*C(k)(2) + C(h)(0)*Power(C(i)(1),2)*C(j)(1)*C(k)(2) +
C(h)(0)*Power(C(i)(2),2)*C(j)(1)*C(k)(2) + C(h)(1)*C(i)(0)*Power(C(j)(1),2)*C(k)(2) -
C(h)(0)*C(i)(1)*Power(C(j)(1),2)*C(k)(2) + C(h)(1)*C(i)(0)*Power(C(j)(2),2)*C(k)(2) -
C(h)(0)*C(i)(1)*Power(C(j)(2),2)*C(k)(2) - C(h)(2)*C(i)(1)*C(j)(0)*Power(C(k)(2),2) +
C(h)(1)*C(i)(2)*C(j)(0)*Power(C(k)(2),2) + C(h)(2)*C(i)(0)*C(j)(1)*Power(C(k)(2),2) -
C(h)(0)*C(i)(2)*C(j)(1)*Power(C(k)(2),2) - C(h)(1)*C(i)(0)*C(j)(2)*Power(C(k)(2),2) + C

```

**f[k]**

```
{C[k][0], C[k][1], C[k][2], C[i][0]*C[i][0] + C[i][1]*C[i][1] + C[i][2]*C[i][2], 1}
```

**Expand [Det [{f[h], f[i], f[j], f[k]}]]**

```

-C[h][2] C[i][1] C[j][0] + C[h][1] C[i][2] C[j][0] + C[h][2] C[i][0] C[j][1] -
C[h][0] C[i][2] C[j][1] - C[h][1] C[i][0] C[j][2] + C[h][0] C[i][1] C[j][2] +
C[h][2] C[i][1] C[k][0] - C[h][1] C[i][2] C[k][0] - C[h][2] C[j][1] C[k][0] +
C[i][2] C[j][1] C[k][0] + C[h][1] C[j][2] C[k][0] - C[i][1] C[j][2] C[k][0] -
C[h][2] C[i][0] C[k][1] + C[h][0] C[i][2] C[k][1] + C[h][2] C[j][0] C[k][1] -
C[i][2] C[j][0] C[k][1] - C[h][0] C[j][2] C[k][1] + C[i][0] C[j][2] C[k][1] +
C[h][1] C[i][0] C[k][2] - C[h][0] C[i][1] C[k][2] - C[h][1] C[j][0] C[k][2] +
C[i][1] C[j][0] C[k][2] + C[h][0] C[j][1] C[k][2] - C[i][0] C[j][1] C[k][2]

```

**f[i\_] := {C[i][0], C[i][1], C[i][2]}; CForm [Expand [Det [{f[h], f[i], f[j]}]]]**

```
-(C(h)(2)*C(i)(1)*C(j)(0)) + C(h)(1)*C(i)(2)*C(j)(0) + C(h)(2)*C(i)(0)*C(j)(1) - C(h)(0)*C
C(h)(1)*C(i)(0)*C(j)(2) + C(h)(0)*C(i)(1)*C(j)(2)
```

```

a = Expand[Det[{f[h], f[i], f[j]}]]

-C[h][2] C[i][1] C[j][0] + C[h][1] C[i][2] C[j][0] + C[h][2] C[i][0] C[j][1] -
C[h][0] C[i][2] C[j][1] - C[h][1] C[i][0] C[j][2] + C[h][0] C[i][1] C[j][2] +
C[h][2] C[i][1] C[k][0] - C[h][1] C[i][2] C[k][0] - C[h][2] C[j][1] C[k][0] +
C[i][2] C[j][1] C[k][0] + C[h][1] C[j][2] C[k][0] - C[i][1] C[j][2] C[k][0] -
C[h][2] C[i][0] C[k][1] + C[h][0] C[i][2] C[k][1] + C[h][2] C[j][0] C[k][1] -
C[i][2] C[j][0] C[k][1] - C[h][0] C[j][2] C[k][1] + C[i][0] C[j][2] C[k][1] +
C[h][1] C[i][0] C[k][2] - C[h][0] C[i][1] C[k][2] - C[h][1] C[j][0] C[k][2] +
C[i][1] C[j][0] C[k][2] + C[h][0] C[j][1] C[k][2] - C[i][0] C[j][1] C[k][2]

CForm[a]

-(C(h)(2)*C(i)(1)*C(j)(0)) + C(h)(1)*C(i)(2)*C(j)(0) + C(h)(2)*C(i)(0)*C(j)(1) - C(h)(0)*C
C(h)(1)*C(i)(0)*C(j)(2) + C(h)(0)*C(i)(1)*C(j)(2) + C(h)(2)*C(i)(1)*C(k)(0) - C(h)(1)*C
C(h)(2)*C(j)(1)*C(k)(0) + C(i)(2)*C(j)(1)*C(k)(0) + C(h)(1)*C(j)(2)*C(k)(0) - C(i)(1)*C
C(h)(2)*C(i)(0)*C(k)(1) + C(h)(0)*C(i)(2)*C(k)(1) + C(h)(2)*C(j)(0)*C(k)(1) - C(i)(2)*C
C(h)(0)*C(j)(2)*C(k)(1) + C(i)(0)*C(j)(2)*C(k)(1) + C(h)(1)*C(i)(0)*C(k)(2) - C(h)(0)*C
C(h)(1)*C(j)(0)*C(k)(2) + C(i)(1)*C(j)(0)*C(k)(2) + C(h)(0)*C(j)(1)*C(k)(2) - C(i)(0)*C

b = Expand[Det[{f[h], f[i], f[j], f[k]}]]

-C[h][2] C[i][1] C[j][0] + C[h][1] C[i][2] C[j][0] + C[h][2] C[i][0] C[j][1] -
C[h][0] C[i][2] C[j][1] - C[h][1] C[i][0] C[j][2] + C[h][0] C[i][1] C[j][2] +
C[h][2] C[i][1] C[k][0] - C[h][1] C[i][2] C[k][0] - C[h][2] C[j][1] C[k][0] +
C[i][2] C[j][1] C[k][0] + C[h][1] C[j][2] C[k][0] - C[i][1] C[j][2] C[k][0] -
C[h][2] C[i][0] C[k][1] + C[h][0] C[i][2] C[k][1] + C[h][2] C[j][0] C[k][1] -
C[i][2] C[j][0] C[k][1] - C[h][0] C[j][2] C[k][1] + C[i][0] C[j][2] C[k][1] +
C[h][1] C[i][0] C[k][2] - C[h][0] C[i][1] C[k][2] - C[h][1] C[j][0] C[k][2] +
C[i][1] C[j][0] C[k][2] + C[h][0] C[j][1] C[k][2] - C[i][0] C[j][1] C[k][2]

a - b

0

Needs["VectorAnalysis`"]

v[k_] := {C[k][0], C[k][1], C[k][2]};

n = CrossProduct[v[k] - v[i], v[j] - v[i]];
Solve[({A[0], A[1], z} - v[i]).n == 0, z][[1, 1, 2]]

(A[1] C[i][2] C[j][0] - A[0] C[i][2] C[j][1] - A[1] C[i][0] C[j][2] +
A[0] C[i][1] C[j][2] - A[1] C[i][2] C[k][0] + C[i][2] C[j][1] C[k][0] +
A[1] C[j][2] C[k][0] - C[i][1] C[j][2] C[k][0] + A[0] C[i][2] C[k][1] -
C[i][2] C[j][0] C[k][1] - A[0] C[j][2] C[k][1] + C[i][0] C[j][2] C[k][1] +
A[1] C[i][0] C[k][2] - A[0] C[i][1] C[k][2] - A[1] C[j][0] C[k][2] +
C[i][1] C[j][0] C[k][2] + A[0] C[j][1] C[k][2] - C[i][0] C[j][1] C[k][2]) /
(C[i][1] C[j][0] - C[i][0] C[j][1] - C[i][1] C[k][0] +
C[j][1] C[k][0] + C[i][0] C[k][1] - C[j][0] C[k][1])

```

```

D[% , A[0]]

(-C[i][2] C[j][1] + C[i][1] C[j][2] + C[i][2] C[k][1] -
 C[j][2] C[k][1] - C[i][1] C[k][2] + C[j][1] C[k][2]) /
(C[i][1] C[j][0] - C[i][0] C[j][1] - C[i][1] C[k][0] +
 C[j][1] C[k][0] + C[i][0] C[k][1] - C[j][0] C[k][1])

CForm[(A[1] C[i][2] C[j][0] - A[0] C[i][2] C[j][1] - A[1] C[i][0] C[j][2] +
 A[0] C[i][1] C[j][2] - A[1] C[i][2] C[k][0] + C[i][2] C[j][1] C[k][0] +
 A[1] C[j][2] C[k][0] - C[i][1] C[j][2] C[k][0] + A[0] C[i][2] C[k][1] -
 C[i][2] C[j][0] C[k][1] - A[0] C[j][2] C[k][1] + C[i][0] C[j][2] C[k][1] +
 A[1] C[i][0] C[k][2] - A[0] C[i][1] C[k][2] - A[1] C[j][0] C[k][2] +
 C[i][1] C[j][0] C[k][2] + A[0] C[j][1] C[k][2] - C[i][0] C[j][1] C[k][2]) /
(C[i][1] C[j][0] - C[i][0] C[j][1] - C[i][1] C[k][0] +
 C[j][1] C[k][0] + C[i][0] C[k][1] - C[j][0] C[k][1])

(A(1)*C(i)(2)*C(j)(0) - A(0)*C(i)(2)*C(j)(1) - A(1)*C(i)(0)*C(j)(2) + A(0)*C(i)(1)*C(j)(2)
 C(i)(1)*C(j)(2)*C(k)(0) + A(0)*C(i)(2)*C(k)(1) - C(i)(2)*C(j)(0)*C(k)(1) - A(0)*C(j)(0)*C(i)(1)*C(k)(2) - A(1)*C(j)(0)*C(k)(2) + C(i)(1)*C(j)(0)*C(k)(2) + A(0)*C(j)(1)*C(i)(1)*C(k)(0) - C(i)(0)*C(j)(1) - C(i)(1)*C(k)(0) + C(j)(1)*C(k)(0) + C(i)(0)*C(k)(1)

Det[{{C[i][1], C[i][2], "C[i][1]*C[i][1]" + "C[i][2]*C[i][2]", 1},
 {C[j][1], C[j][2], "C[j][1]*C[j][1]" + "C[j][2]*C[j][2]", 1},
 {C[k][1], C[k][2], "C[k][1]*C[k][1]" + "C[k][2]*C[k][2]", 1},
 {C[p][1], C[p][2], "C[p][1]*C[p][1]" + "C[p][2]*C[p][2]", 1}}]

-C[k][1]*C[k][1] C[i][2] C[j][1] - C[k][2]*C[k][2] C[i][2] C[j][1] +
C[p][1]*C[p][1] C[i][2] C[j][1] + C[p][2]*C[p][2] C[i][2] C[j][1] +
C[k][1]*C[k][1] C[i][1] C[j][2] + C[k][2]*C[k][2] C[i][1] C[j][2] -
C[p][1]*C[p][1] C[i][1] C[j][2] - C[p][2]*C[p][2] C[i][1] C[j][2] +
C[j][1]*C[j][1] C[i][2] C[k][1] + C[j][2]*C[j][2] C[i][2] C[k][1] -
C[p][1]*C[p][1] C[i][2] C[k][1] - C[p][2]*C[p][2] C[i][2] C[k][1] -
C[i][1]*C[i][1] C[j][2] C[k][1] - C[i][2]*C[i][2] C[j][2] C[k][1] +
C[p][1]*C[p][1] C[j][2] C[k][1] + C[p][2]*C[p][2] C[j][2] C[k][1] -
C[j][1]*C[j][1] C[i][1] C[k][2] - C[j][2]*C[j][2] C[i][1] C[k][2] +
C[p][1]*C[p][1] C[i][1] C[k][2] + C[p][2]*C[p][2] C[i][1] C[k][2] +
C[i][1]*C[i][1] C[j][2] C[k][2] + C[i][2]*C[i][2] C[j][2] C[k][2] -
C[p][1]*C[p][1] C[j][1] C[k][2] - C[p][2]*C[p][2] C[j][1] C[k][2] -
C[j][1]*C[j][1] C[i][2] C[p][1] - C[j][2]*C[j][2] C[i][2] C[p][1] +
C[k][1]*C[k][1] C[i][2] C[p][1] + C[k][2]*C[k][2] C[i][2] C[p][1] +
C[i][1]*C[i][1] C[j][2] C[p][1] + C[i][2]*C[i][2] C[j][2] C[p][1] -
C[k][1]*C[k][1] C[j][2] C[p][1] - C[k][2]*C[k][2] C[j][2] C[p][1] -
C[i][1]*C[i][1] C[k][2] C[p][1] - C[i][2]*C[i][2] C[k][2] C[p][1] +
C[j][1]*C[j][1] C[k][2] C[p][1] + C[j][2]*C[j][2] C[k][2] C[p][1] +
C[j][1]*C[j][1] C[i][1] C[p][2] + C[j][2]*C[j][2] C[i][1] C[p][2] -
C[k][1]*C[k][1] C[i][1] C[p][2] - C[k][2]*C[k][2] C[i][1] C[p][2] -
C[i][1]*C[i][1] C[j][1] C[p][2] - C[i][2]*C[i][2] C[j][1] C[p][2] +
C[k][1]*C[k][1] C[j][1] C[p][2] + C[k][2]*C[k][2] C[j][1] C[p][2] +
C[i][1]*C[i][1] C[k][1] C[p][2] + C[i][2]*C[i][2] C[k][1] C[p][2] -
C[j][1]*C[j][1] C[k][1] C[p][2] - C[j][2]*C[j][2] C[k][1] C[p][2]

```

**CForm [%]**

```

C(i)(2)*Power(C(j)(1),2)*C(k)(1) - Power(C(i)(1),2)*C(j)(2)*C(k)(1) - Power(C(i)(2),2)*C(j)
C(i)(2)*C(j)(1)*Power(C(k)(1),2) + C(i)(1)*C(j)(2)*Power(C(k)(1),2) + Power(C(i)(1),2)*
C(i)(1)*Power(C(j)(1),2)*C(k)(2) - C(i)(1)*Power(C(j)(2),2)*C(k)(2) - C(i)(2)*C(j)(1)*P
C(i)(2)*Power(C(j)(1),2)*C(p)(1) + Power(C(i)(1),2)*C(j)(2)*C(p)(1) + Power(C(i)(2),2)*
C(i)(2)*Power(C(k)(1),2)*C(p)(1) - C(j)(2)*Power(C(k)(1),2)*C(p)(1) - Power(C(i)(1),2)*
Power(C(j)(1),2)*C(k)(2)*C(p)(1) + Power(C(j)(2),2)*C(k)(2)*C(p)(1) + C(i)(2)*Power(C(k
C(i)(2)*C(j)(1)*Power(C(p)(1),2) - C(i)(1)*C(j)(2)*Power(C(p)(1),2) - C(i)(2)*C(k)(1)*P
C(i)(1)*C(k)(2)*Power(C(p)(1),2) - C(j)(1)*C(k)(2)*Power(C(p)(1),2) - Power(C(i)(1),2)*
C(i)(1)*Power(C(j)(1),2)*C(p)(2) + C(i)(1)*Power(C(j)(2),2)*C(p)(2) + Power(C(i)(1),2)*
Power(C(j)(1),2)*C(k)(1)*C(p)(2) - Power(C(j)(2),2)*C(k)(1)*C(p)(2) - C(i)(1)*Power(C(k
C(i)(1)*Power(C(k)(2),2)*C(p)(2) + C(j)(1)*Power(C(k)(2),2)*C(p)(2) + C(i)(2)*C(j)(1)*P
C(i)(2)*C(k)(1)*Power(C(p)(2),2) + C(j)(2)*C(k)(1)*Power(C(p)(2),2) + C(i)(1)*C(k)(2)*P

```

$$(n^4 - (n^3 - (n^2 - n) / 2) / 2) / 2$$

$$(n^3 - (n^2 - n) / 2) / 2$$

$$\frac{1}{2} \left( n^3 + \frac{1}{2} (n - n^2) \right)$$

% /. n → 3

5

7 ^ 3

343

$$(n^2 - n) / 2$$

$$\frac{1}{2} (-n + n^2)$$

$$(n^3 - n^2 - 2 * (n + 1)) / 2$$

$$\frac{1}{2} (-n^2 + n^3 - 2 (1 + n))$$

=.

**Exit []**

**A[[]]**

A

```
CForm[Det[{{A[[e]], A[[1]], 1}, {C[[Dreieck[[p, i]], 0]], C[[Dreieck[[p, i]], 1]], 1},  
{C[[Dreieck[[p, j]], 0]], C[[Dreieck[[p, j]], 1]], 1}}]]  
Part::pspec : Part specification e is neither an integer nor a list of integers. >>  
Part::partd : Part specification A[[1]] is longer than depth of object. >>  
Part::pspec : Part specification p is neither an integer nor a list of integers. >>  
Part::pspec : Part specification Dreieck[[p, i]] is neither an integer nor a list of integers. >>  
General::stop : Further output of Part::pspec will be suppressed during this calculation. >>  
-(A[1]*C[Dreieck[p][i]][0]) + A[e]*C[Dreieck[p][i]][1] + A[1]*C[Dreieck[p][j]][0] - C[Drei  
A[e]*C[Dreieck[p][j]][1] + C[Dreieck[p][i]][0]*C[Dreieck[p][j]][1]
```