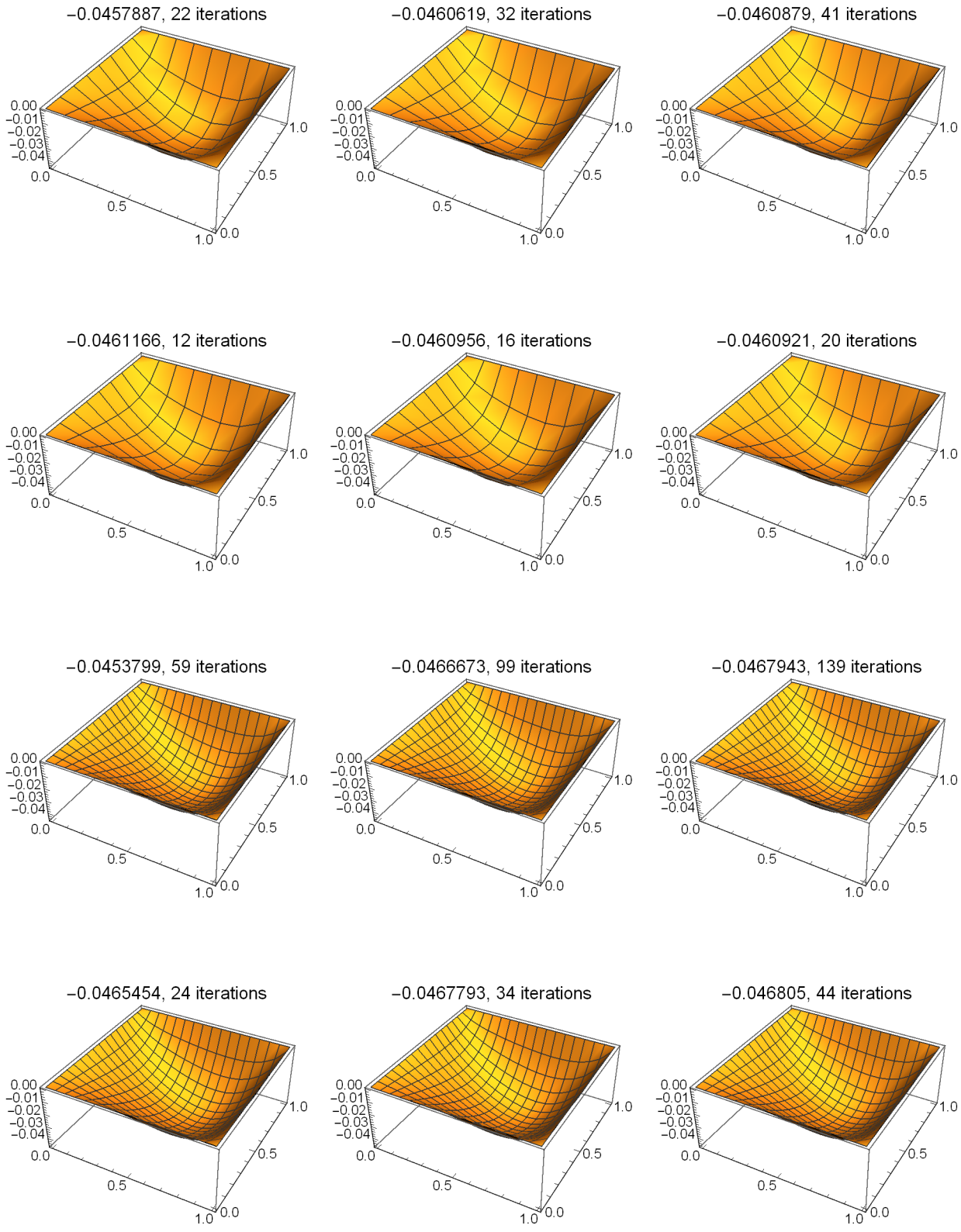
In[1]:=
```
(* MA39110 / Assignment 9.2 / 16MA20053 / NER ROHIT *)
ClearAll["Global`*"];
```

In[2]:=
```
cnt = 0; max = 0;
Model[n0_, eps0_, sor0_] := Module[{n = n0, eps = eps0, sor = sor0},
   x0 = 0; xf = 1; h = (xf - x0) / n;
   X = Table[x0 + x * h, {x, 1, n - 1}];
   XT = Table[x0 + x * h, {x, 0, n}];
   f[x_, y_] = x^2 y^2;
   U = Table[0, {x, 1, n + 1}, {y, 1, n + 1}];
   UT = U;
   w = 1.5;
   cnt = 0;
   While[
    {
     cnt += 1;
     U = N[UT];
     For[i = 1, i < n, i++,
      {
       For[j = 1, j < n, j++,
         {
          im = i + 1;
          jm = j + 1;
          UT[[im, jm]] = (U[[im + 1, jm]] + U[[im - 1, jm]] +
               U[[im, jm + 1]] + U[[im, jm - 1]] - h^2 (XT[[im]]^2 + XT[[jm]]^2)) / 4;
          If[sor == 1, UT[[im, jm]] = w * UT[[im, jm]] + (1 - w) * U[[im, jm]]];
         }];
      }];
     For[i = 1, i < n, i++,
      {
       For[j = 1, j < n, j++,
         {
          im = i + 1;
          jm = j + 1;
          UT[[im, jm]] = (UT[[im + 1, jm]] + UT[[im - 1, jm]] + UT[[im, jm + 1]] +
               UT[[im, jm - 1]] - h^2 (XT[[im]]^2 + XT[[jm]]^2)) / 4;
          If[sor == 1, UT[[im, jm]] = w * UT[[im, jm]] + (1 - w) * U[[im, jm]]];
         }];
      }];
    }; N[Max[Abs[UT - U]]] > eps];
   max = Max[Abs[U]];
   U
  ];
```

In[194]:=
```
GraphicsGrid[
 {{ListPlot3D[Model[8, 10^-4, 0], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full], ListPlot3D[Model[8, 10^-5, 0],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[8, 10^-6, 0], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full]}, {ListPlot3D[Model[8, 10^-4, 1],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[8, 10^-5, 1], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full], ListPlot3D[Model[8, 10^-6, 1],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full]},
  {ListPlot3D[Model[16, 10^-4, 0], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full], ListPlot3D[Model[16, 10^-5, 0],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[16, 10^-6, 0], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full]}, {ListPlot3D[Model[16, 10^-4, 1],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[16, 10^-5, 1], DataRange → {{0, 1}, {0, 1}}, PlotRange → Full,
    PlotLabel → Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12],
    Mesh → Full], ListPlot3D[Model[16, 10^-6, 1],
    DataRange → {{0, 1}, {0, 1}}, PlotRange → Full, PlotLabel →
     Style[StringForm["-``, `` iterations", max, cnt], FontSize → 12], Mesh → Full]}}]
```


−0.0457887, 22 iterations
−0.0460619, 32 iterations
−0.0460879, 41 iterations
−0.0461166, 12 iterations
−0.0460956, 16 iterations
−0.0460921, 20 iterations
Out[194]=
−0.0453799, 59 iterations
−0.0466673, 99 iterations
−0.0467943, 139 iterations
−0.0465454, 24 iterations
−0.0467793, 34 iterations
−0.046805, 44 iterations