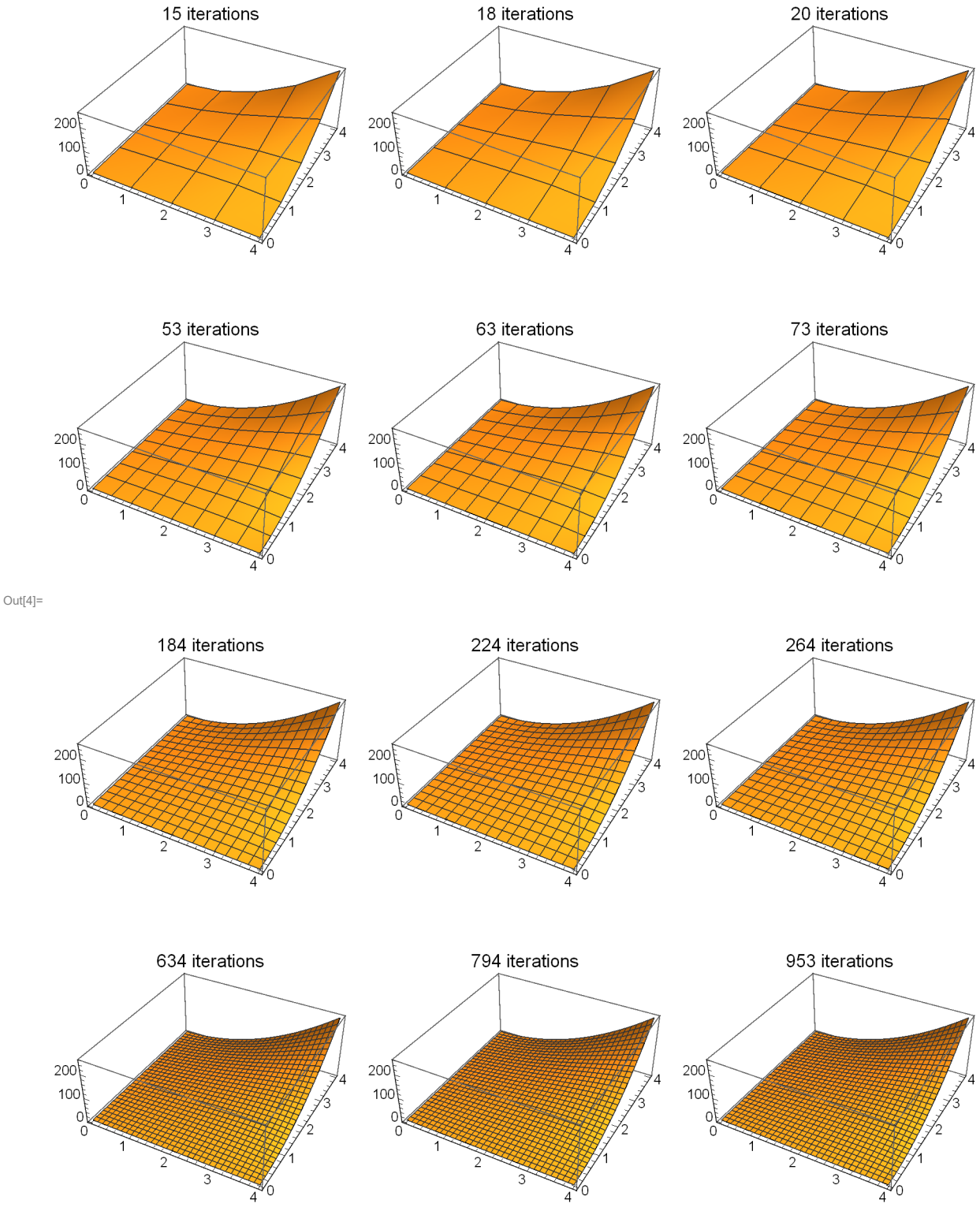
In[1]:=
```
(* MA39110 / Assignment 9.1 / 16MA20053 / NER ROHIT *)
ClearAll["Global`*"];
```

In[2]:=
```
cnt = 0;
Model[n0_, eps0_] := Module[{n = n0, eps = eps0},
   x0 = 0; xf = 4; 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}];
   U[[All, n + 1]] = Table[16 XT[[x]]^2, {x, 1, n + 1}];
   U[[n + 1, All]] = Table[16 XT[[x]]^2, {x, 1, n + 1}];
   UT = U;
   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]]) / 4;
         }];
      }];
     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]]) / 4;
         }];
      }];
    }; N[Max[Abs[UT - U]]] > eps];
   U
  ];
```

In[4]:=
```
GraphicsGrid[
 {{ListPlot3D[Model[4, 10^-4], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[4, 10^-5], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[4, 10^-6], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full]},
  {ListPlot3D[Model[8, 10^-4], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[8, 10^-5], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[8, 10^-6], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full]},
  {ListPlot3D[Model[16, 10^-4], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[16, 10^-5], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[16, 10^-6], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full]},
  {ListPlot3D[Model[32, 10^-4], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[32, 10^-5], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full],
   ListPlot3D[Model[32, 10^-6], DataRange → {{0, 4}, {0, 4}}, PlotRange → Full,
    PlotLabel → Style[StringForm["`` iterations", cnt], FontSize → 12], Mesh → Full]}}]
```

Out[4]=


15 iterations
18 iterations
20 iterations
53 iterations
63 iterations
73 iterations
184 iterations
224 iterations
264 iterations
634 iterations
794 iterations
953 iterations