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In[1]:= (* MA39110 / Assignment 1 / 16MA20053 / NER ROHIT *)
ClearAll["Global`*"];
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In[2]:= Thomas[a_, b_, c_, d_] :=
Module[{c1 = Range[Length[c]], d1 = Range[Length[d]], x = Range[Length[b]]},
  c1[[1]] = c[[1]]/b[[1]]; d1[[1]] = d[[1]]/b[[1]];
  Do[
    If[i ≠ Length[d], c1[[i]] = c[[i]]/(b[[i]] - a[[i-1]]*c1[[i-1]]);
    d1[[i]] = (d[[i]] - a[[i-1]]*d1[[i-1]])/(b[[i]] - a[[i-1]]*c1[[i-1]]);
    , {i, 2, Length[d]}];
  x[[Length[b]]] = d1[[Length[b]]];
  Do[
    x[[i]] = d1[[i]] - c1[[i]]*x[[i+1]];
    , {i, Length[b]-1, 1, -1}];
  x];
```

```
Model[n0_] := Module[{n = n0},
  x0 = 1; xf = 1.4; h = (xf - x0)/n;
  y0 = 0; yf = 0.0566;
  A = Table[0, {x, 1, n-1}, {y, 1, n-1}];
  X = Table[x0 + x*h, {x, 1, n-1}];
  B = Table[2*h^2, {x, 1, n-1}];
  For[i = 1, i < n, i++,
    {
      A[[i, i]] = -4*X[[i]]^2;
      If[i ≠ 1, A[[i, i-1]] = 2*X[[i]]^2 - h*X[[i]]];
      If[i ≠ n-1, A[[i, i+1]] = 2*X[[i]]^2 + h*X[[i]]];
    }];
  B[[1]] -= y0*(2*X[[1]]^2 - h*X[[1]]);
  B[[n-1]] -= yf*(2*X[[n-1]]^2 + h*X[[n-1]]);
  Thomas[Diagonal[A, -1], Diagonal[A], Diagonal[A, 1], B];
```

```
In[4]:= sol = Model[4];
Show[{Plot[0.5*Log[x]^2, {x, x0, xf}, PlotLabel → Style["h=0.1", FontSize → 18]],
  {ListPlot[Transpose[{X, sol}], PlotStyle → Red]}]
sol = Model[8];
Show[{Plot[0.5*Log[x]^2, {x, x0, xf}, PlotLabel → Style["h=0.05", FontSize → 18]],
  {ListPlot[Transpose[{X, sol}], PlotStyle → Red]}]
sol = Model[40];
Show[{Plot[0.5*Log[x]^2, {x, x0, xf}, PlotLabel → Style["h=0.01", FontSize → 18]],
  {ListPlot[Transpose[{X, sol}], PlotStyle → Red]}]
```

