

```

In[95]:= (* MA39110 / Assignment 12 / 16MA20053 / NER ROHIT *)
ClearAll["Global`*"];

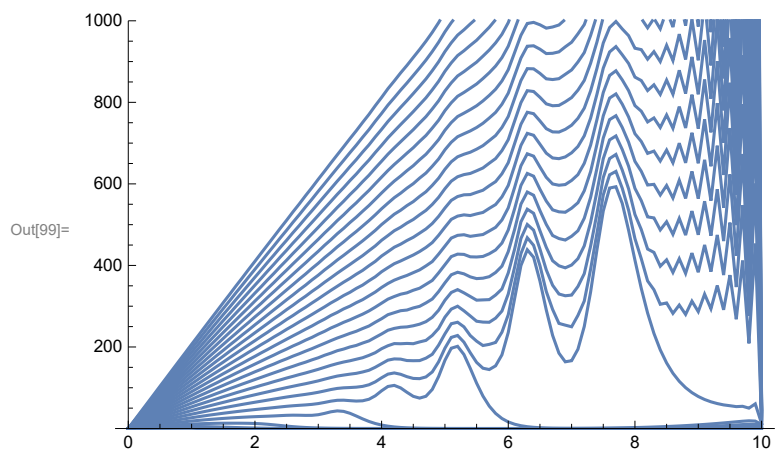
In[96]:= Thomas[a_, b_, c_, d_] :=
Module[{c1 = Range[Length[c]], d1 = Range[Length[d]], x = Range[Length[b]]},
  c1[[1]] = c[[1]]/b[[1]]; d1[[1]] = d[[1]]/b[[1]];
  Do[
    If[i ≠ Length[d], c1[[i]] = c[[i]]/(b[[i]] - a[[i - 1]] * c1[[i - 1]]);
    d1[[i]] = (d[[i]] - a[[i - 1]] * d1[[i - 1]])/(b[[i]] - 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_, k0_, t0_] := Module[{n = n0 * 10, k = k0, t = t0},
  x0 = 0; xf = 10; h = (xf - x0)/n;
  X = Table[x0 + x * h, {x, 1, n - 1}];
  XT = Table[x0 + x * h, {x, 0, n}];
  A = Table[0, {x, 1, n - 1}, {y, 1, n - 1}];
  B = Table[0, {x, 1, n - 1}];
  nu = 0.5;
  s = nu * k / h^2;
  f[x_] = Piecewise[{{x, 0 ≤ x ≤ 1}, {0, x < 0}, {0, x > 1}}];
  U = Table[f[XT[[x]]], {x, 1, n + 1}];
  UT = U;
  PLT = Table[0, {x, 1, t}];
  For[j = 1, j ≤ t, j++, {
    U = UT;
    For[i = 1, i < n, i++,
      {
        im = i + 1;
        A[[i, i]] = 1 + s;
        B[[i]] = 0.5 s * U[[im - 1]] + (1 - s) U[[im]] + s * U[[im + 1]] / 2;
        If[i ≠ 1, A[[i, i - 1]] = -k * U[[im - 1]] / (4 h) - s / 2];
        If[i ≠ n - 1, A[[i, i + 1]] = k * U[[im + 1]] / (4 h) - s / 2];
      }];
    UT =
      U + N[Flatten[{{0}, Thomas[Diagonal[A, -1], Diagonal[A], Diagonal[A, 1], B], {1}}]]];
    PLT[[j]] = ListLinePlot[Transpose[{XT, U}], PlotRange → {0, 1000}];
  }];
  PLT
];

In[98]:= (*Manipulate[Model[10,0.2,Floor[t]],{t,1,100}]**)

```

```
In[99]:= Show[Model[10, 0.2, 50][[1 ;; 50][[1 ;; 2]]]
```



```
In[100]:= Show[Model[10, 0.2, 50][[1 ;; 50][[5 ;; 1]]], PlotRange -> Automatic]
```

