Pursuit and evation in one dimensional space

■ Uniform solution

In[310]:=
```
deq = {u'[t] == r (1 - u[t] / K) u[t] - a u[t] v[t],
  v'[t] == b u[t] v[t] - d v[t], u[0] == u0, v[0] == v0}
```

Out[310]=

$$\left\{u'[t] == r\,u[t]\left(1 - \frac{u[t]}{K}\right) - a\,u[t]\,v[t],\ v'[t] == -d\,v[t] + b\,u[t]\,v[t],\ u[0] == u0,\ v[0] == v0\right\}$$

In[311]:=
```
para = {r → 1, K → 2, a → 1, b → 1, d → 1}
```

Out[311]=
```
{r → 1, K → 2, a → 1, b → 1, d → 1}
```

In[312]:=
```
deqN = deq /. para /. {u0 → 2, v0 → 0.01}
```

Out[312]=

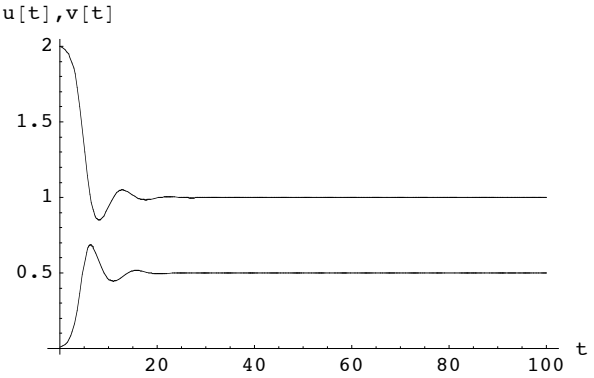
$$\left\{u'[t] == \left(1 - \frac{u[t]}{2}\right) u[t] - u[t]\,v[t],\ v'[t] == -v[t] + u[t]\,v[t],\ u[0] == 2,\ v[0] == 0.01\right\}$$

In[313]:=
```
endT = 100;
```

In[314]:=
```
sol = NDSolve[deqN, {u[t], v[t]}, {t, 0, endT}]
```

Out[314]=
```
{{u[t] → InterpolatingFunction[{{0., 100.}}, <>][t],
  v[t] → InterpolatingFunction[{{0., 100.}}, <>][t]}}
```

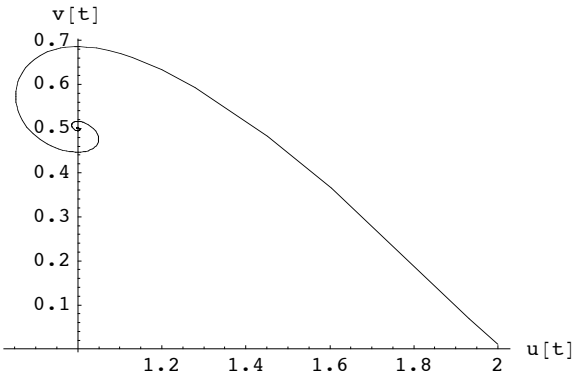
In[315]:=
```
Plot[ {Evaluate[u[t]] /. sol, Evaluate[v[t]] /. sol},
 {t, 0, endT}, PlotRange → All, AxesLabel → {"t", "u[t],v[t]"}]
```



Out[315]=
```
- Graphics -
```

In[316]:=

```
ParametricPlot[Evaluate[{u[t], v[t]}] /. sol,
 {t, 0, endT}, PlotRange → All, AxesLabel → {"u[t]", "v[t]"}]
```



Out[316]=

```
- Graphics -
```

In[257]:=

```
2
```

Out[257]=

```
2
```

■ Reation diffusion

In[290]:=

```
drawFigure[x1_List, x2_List, opt___] := Block[{g1, g2},
  g1 = ListPlot[x1, PlotJoined → True,
    PlotStyle → RGBColor[0, 0, 1], opt, DisplayFunction → Identity];
  g2 = ListPlot[x2, PlotJoined → True, PlotStyle → RGBColor[1, 0, 0],
    opt, DisplayFunction → Identity];
  Return[Show[g1, g2, DisplayFunction → $DisplayFunction]];
 ]
```

In[291]:=

```
size = 101;
data1 = ReadList["RD-1dim-test-u", {Real, Real}];
data1 = Partition[data1, size];
Length[data1]

data2 = ReadList["RD-1dim-test-v", {Real, Real}];
data2 = Partition[data2, size];
Length[data2]
```

Out[294]=

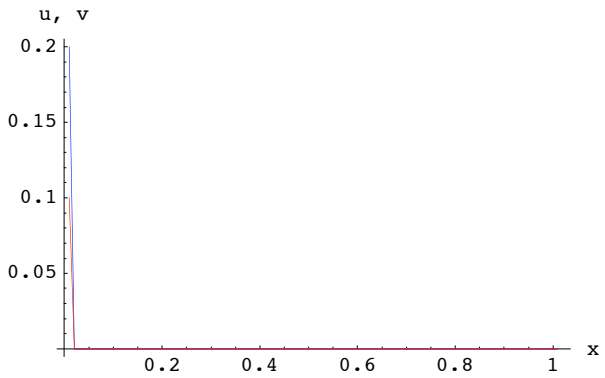
```
101
```

Out[297]=

```
101
```

In[317]:=

```
drawFigure[data1[[1]], data2[[1]], PlotRange → All, AxesLabel → {"x", "u, v"}]
```

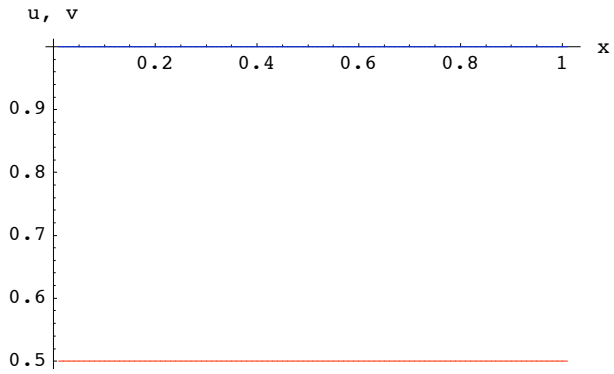


Out[317]=

```
- Graphics -
```

In[318]:=

```
drawFigure[Last[data1], Last[data2], PlotRange → All, AxesLabel → {"x", "u, v"}]
```

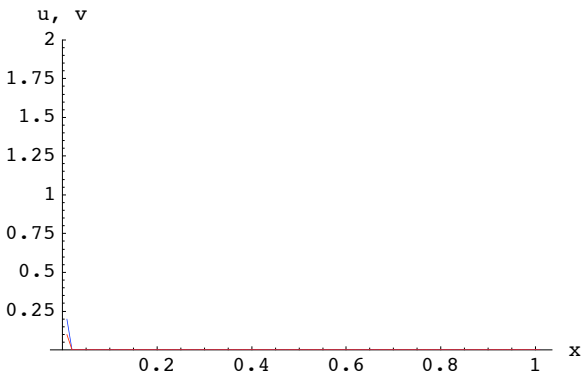


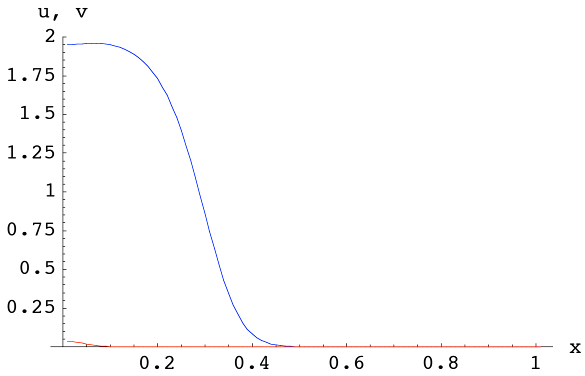
Out[318]=

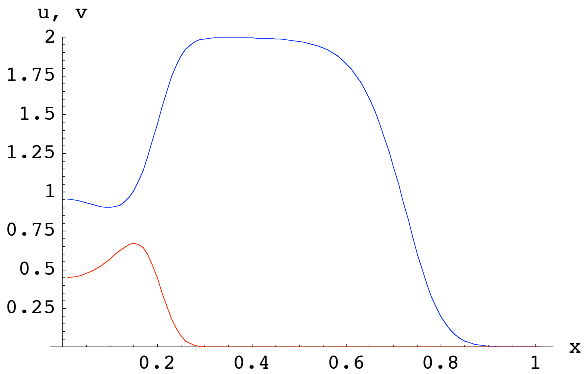
```
- Graphics -
```

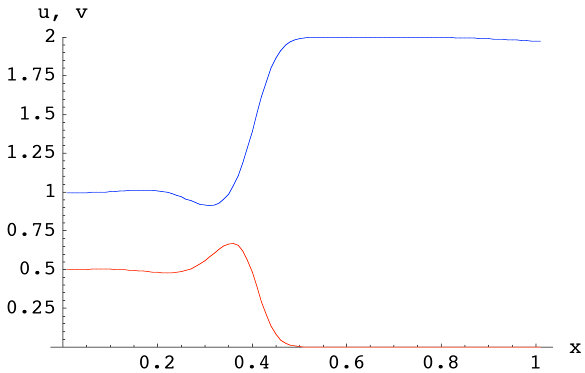
In[325]:=

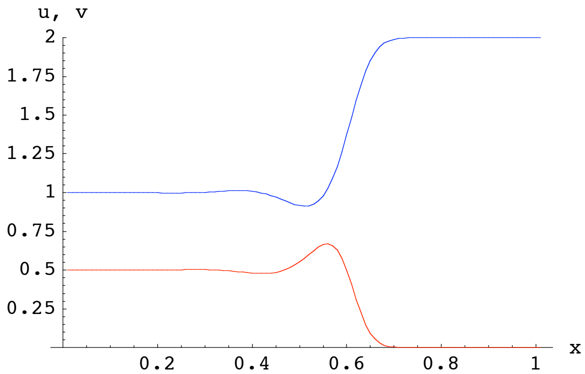
```
Do[
 drawFigure[data1[[i]], data2[[i]], PlotRange → {0, 2}, AxesLabel → {"x", "u, v"}],
 {i, 1, Length[data1], 10}
]
```

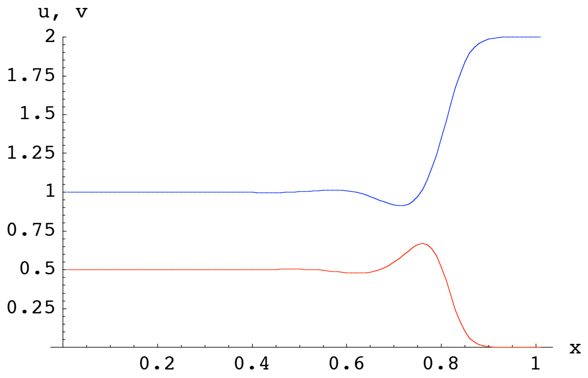


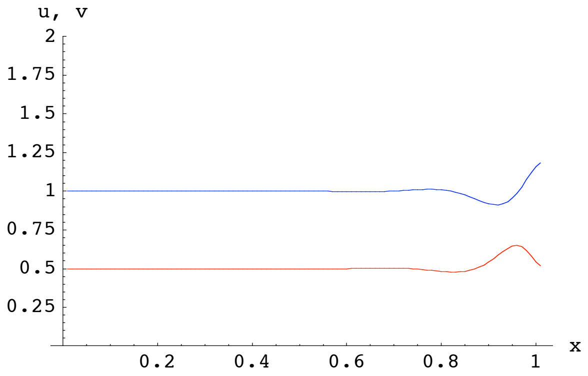

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

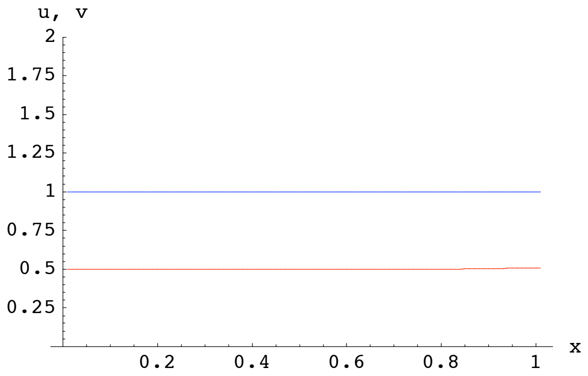

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

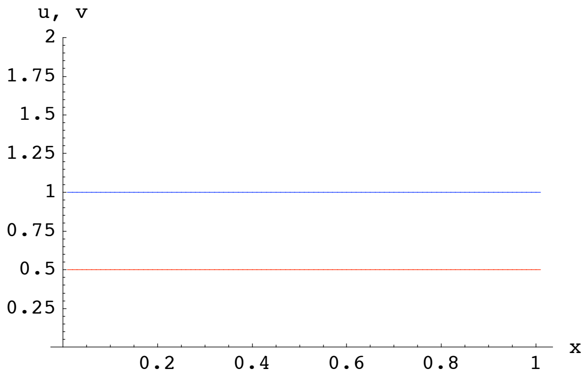

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

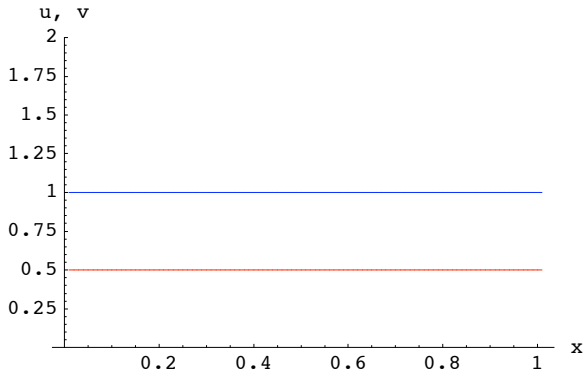

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

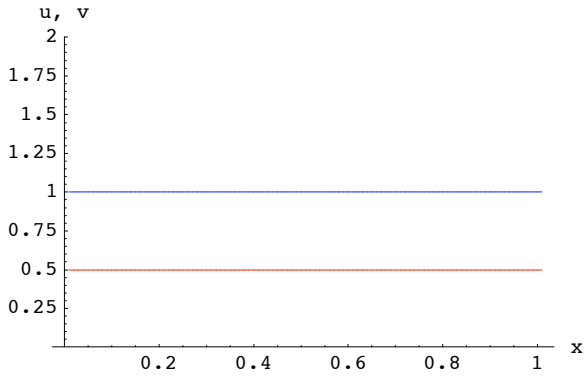

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

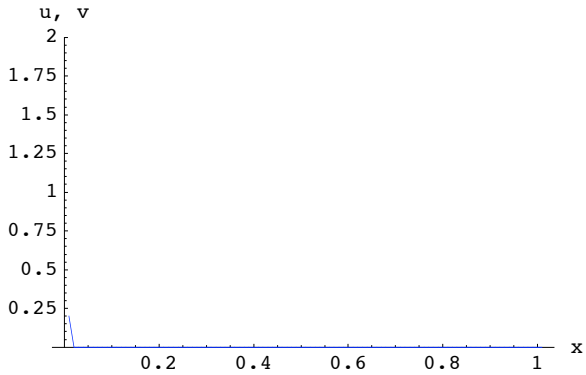

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

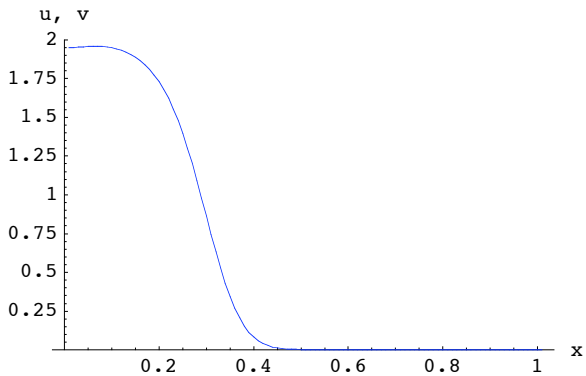


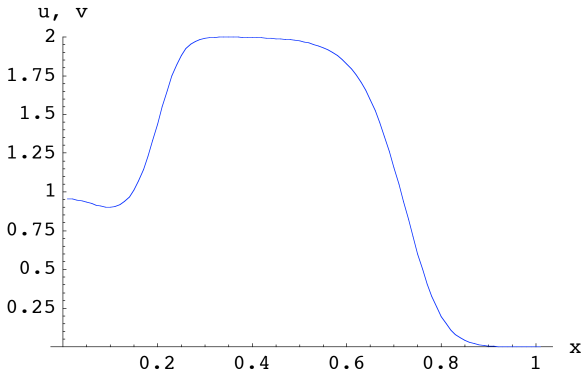


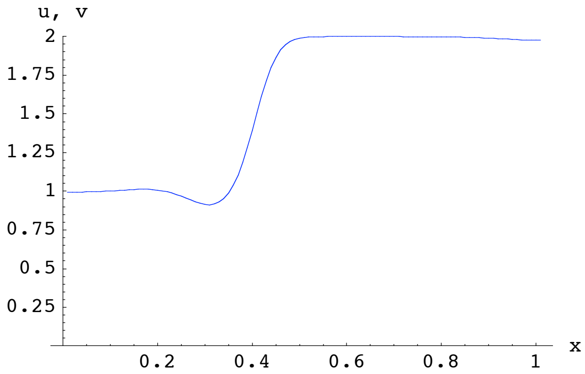
In[320]:=

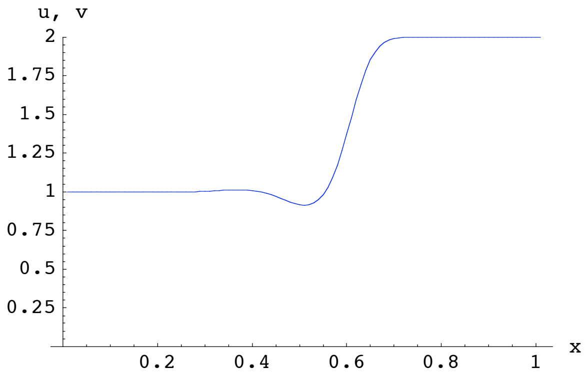
```
gUList = {};
Do[
 g = ListPlot[data1[[i]], PlotJoined → True,
   PlotStyle → RGBColor[0, 0, 1], PlotRange → {0, 2}, AxesLabel → {"x", "u, v"}];
 AppendTo[gUList, g], {i, 1, Length[data1], 10}
]
```

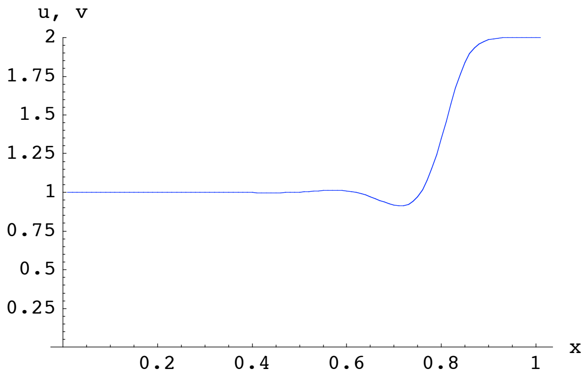


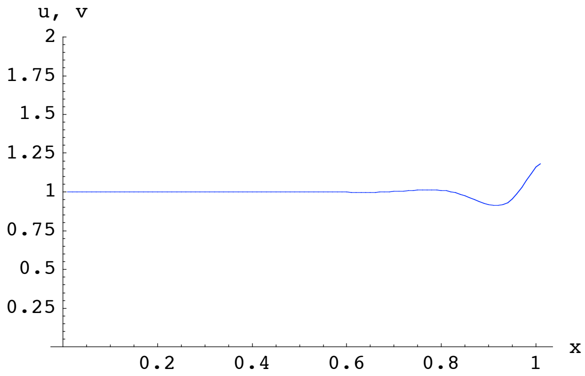


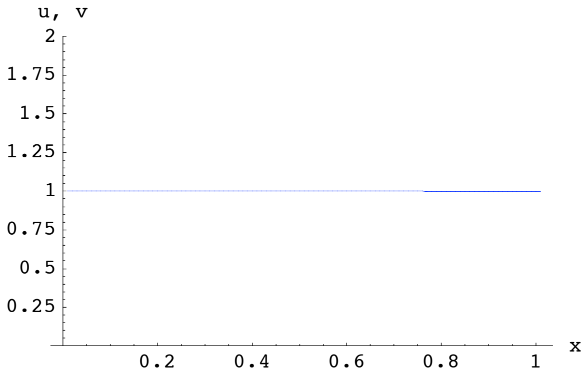

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2 0.4 0.6 0.8 1
x

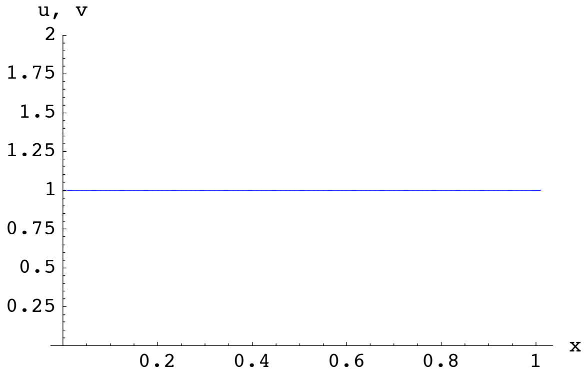

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2 0.4 0.6 0.8 1
x

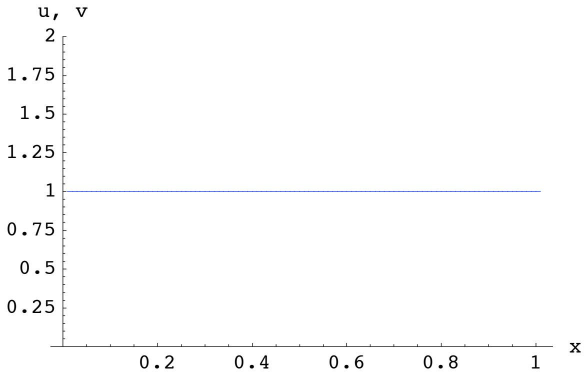

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2 0.4 0.6 0.8 1
x

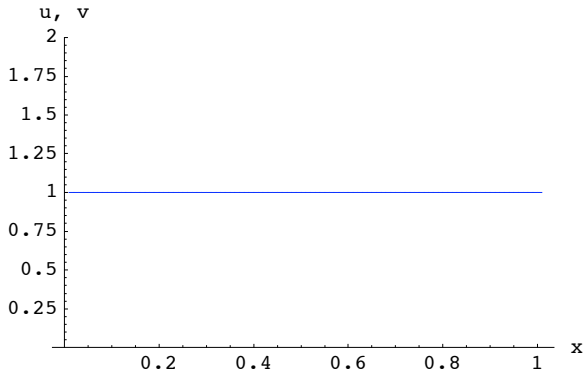

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2 0.4 0.6 0.8 1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

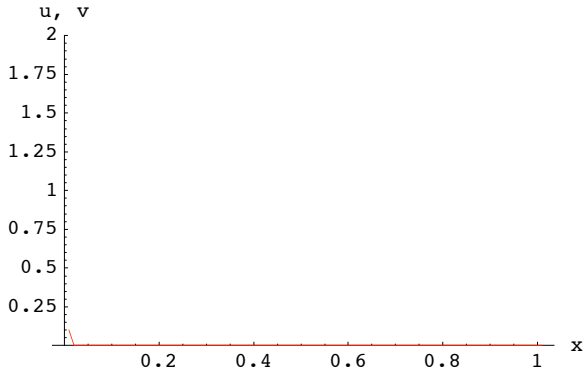

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

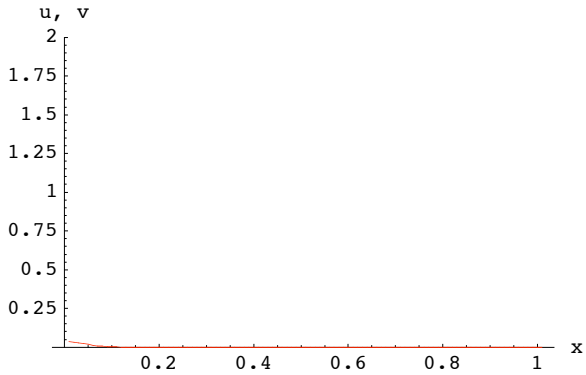

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

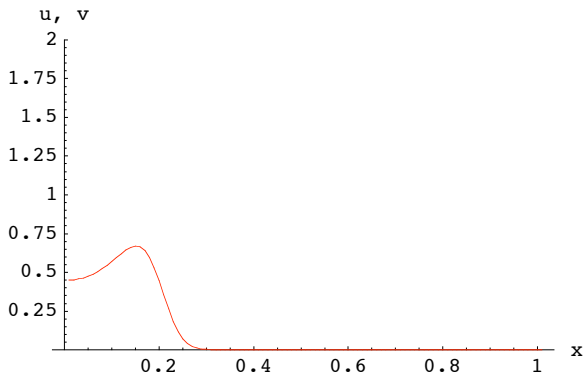


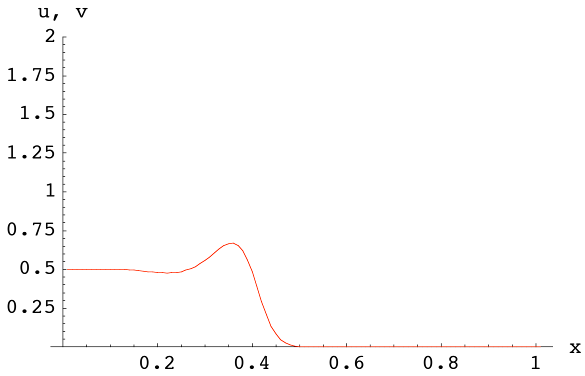
In[322]:=

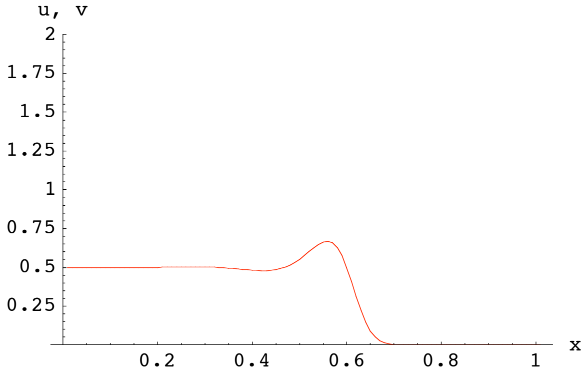
```
gVList = {};
Do[
 g = ListPlot[data2[[i]], PlotJoined → True,
   PlotStyle → RGBColor[1, 0, 0], PlotRange → {0, 2}, AxesLabel → {"x", "u, v"}];
 AppendTo[gVList, g], {i, 1, Length[data1], 10}
]
```

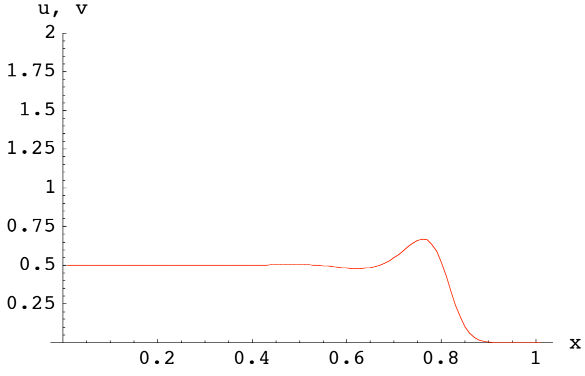


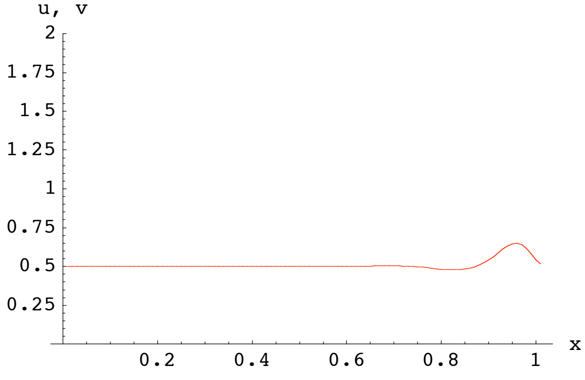


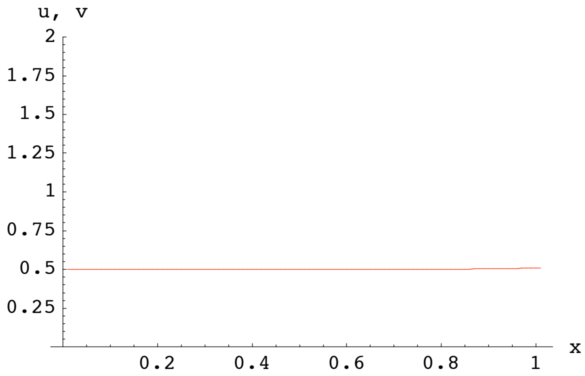


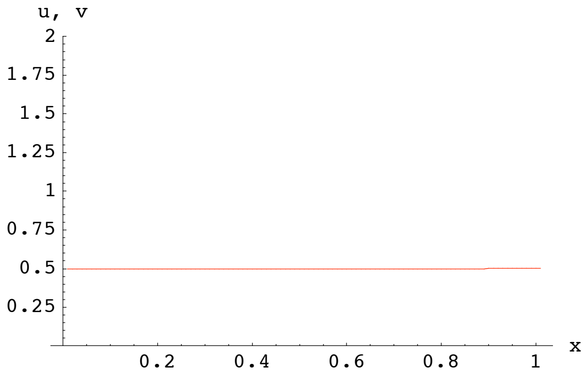

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

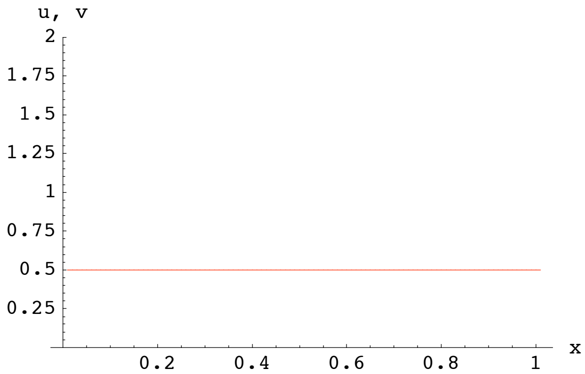

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

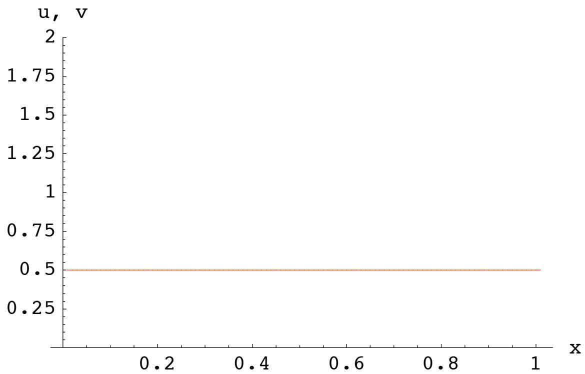

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

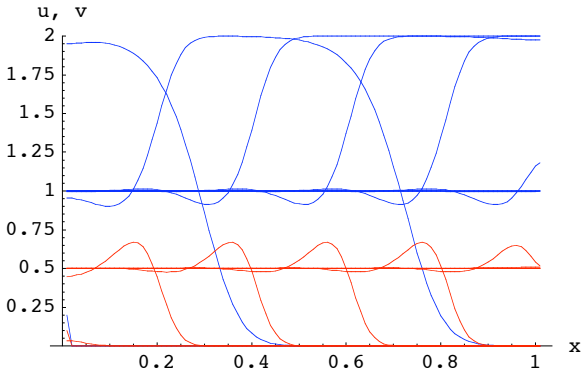

u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x


u, v
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0.2
0.4
0.6
0.8
1
x

In[324]:=

```
Show[gUList, gVList]
```



Out[324]=

```
- Graphics -
```

In[309]:=

```
2
```

Out[309]=

```
2
```