



In[1528]:=

```
sol = NDSolve[{x'[t] == 1 - x[t] * x[t] - y[t] * y[t],  
y'[t] == 2 x[t], x[0] == 0, y[0] == 0}, {x[t], y[t]}, {t, 0, tend}]
```

Out[1528]=

```
{ {x[t] → InterpolatingFunction[ Domain: {{0., 10.}}  
Output: scalar] [t],  
  
y[t] → InterpolatingFunction[ Domain: {{0., 10.}}  
Output: scalar] [t]} }
```

In[1529]:=

```
plotX = Plot[x[t] /. sol, {t, 0, tend}, PlotStyle → Black];  
plotY = Plot[y[t] /. sol, {t, 0, tend}, PlotStyle → Black];  
h = 0.05; t0 = 0; tend = 10;  
grid = Table[i, {i, t0, tend, h}];
```

In[1532]:=

```
runge = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/runge.txt", "Table"];  
expeuler = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/explicit_euler.txt", "Table"];  
impeuler = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/implicit_euler.txt", "Table"];  
symmetric = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/symmetric.txt", "Table"];  
adams = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/adams_bashforth.txt", "Table"];  
predictor = Import[  
  "/Users/ivandybko/Projects/Numerical_methods/Mathematical physics/Lab1  
  (Numerical methods for solving ordinary differential  
  equations)/data/test2/adams_bashforth_with_predictor_corrector.txt",  
  "Table"];
```

In[1538]:=

```

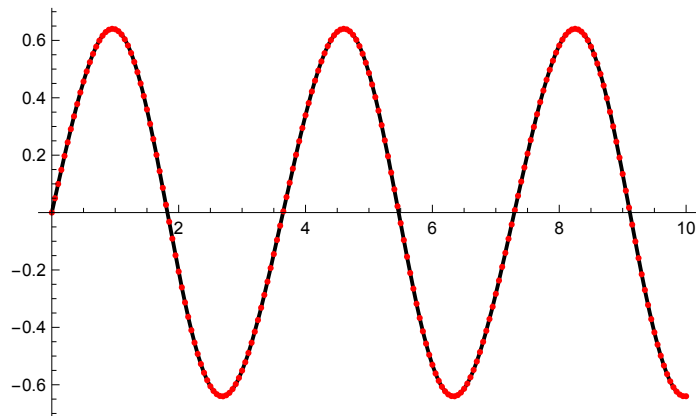
plotRungeX = ListPlot[Transpose[{grid, runge[[All, 1]]}], PlotStyle → Red];
plotRungeY = ListPlot[Transpose[{grid, runge[[All, 2]]}], PlotStyle → Red];
plotExpeulerX = ListPlot[Transpose[{grid, expeuler[[All, 1]]}], PlotStyle → Red];
plotExpeulerY = ListPlot[Transpose[{grid, expeuler[[All, 2]]}], PlotStyle → Red];
plotImpeulerX = ListPlot[Transpose[{grid, impeuler[[All, 1]]}], PlotStyle → Red];
plotImpeulerY = ListPlot[Transpose[{grid, impeuler[[All, 2]]}], PlotStyle → Red];
plotSymmetricX = ListPlot[Transpose[{grid, symmetric[[All, 1]]}], PlotStyle → Red];
plotSymmetricY =
  ListPlot[Transpose[{grid, symmetric[[All, 2]]}], PlotStyle → Red];
plotAdamsX = ListPlot[Transpose[{grid, adams[[All, 1]]}], PlotStyle → Red];
plotAdamsY = ListPlot[Transpose[{grid, adams[[All, 2]]}], PlotStyle → Red];
plotPredictorX = ListPlot[Transpose[{grid, predictor[[All, 1]]}], PlotStyle → Red];
plotPredictorY =
  ListPlot[Transpose[{grid, predictor[[All, 2]]}], PlotStyle → Red];

```

In[1544]:=

```
Show[plotX, plotRungeX, PlotRange → All]
```

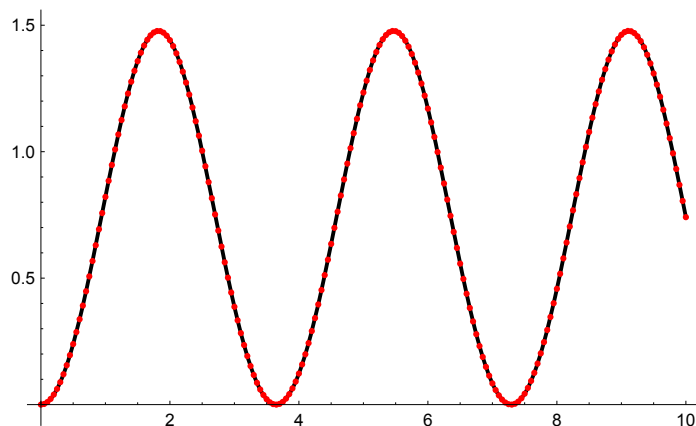
Out[1544]=



In[1545]:=

```
Show[plotY, plotRungeY, PlotRange → All]
```

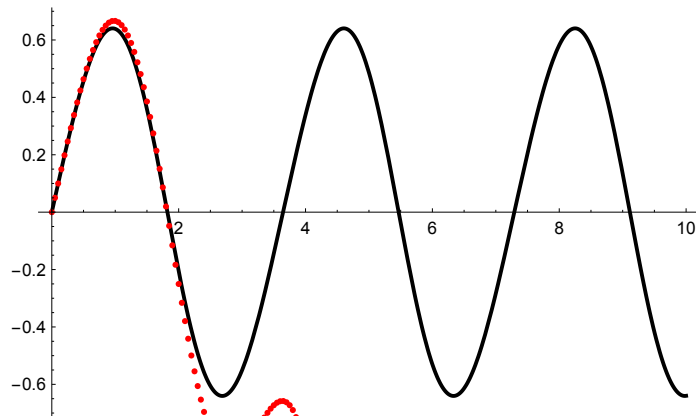
Out[1545]=



In[1558]:=

**Show[plotX, plotExpeulerX]**

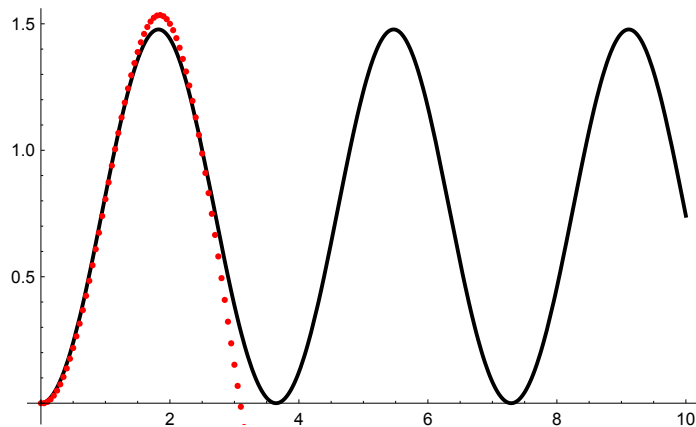
Out[1558]=



In[1557]:=

**Show[plotY, plotExpeulerY]**

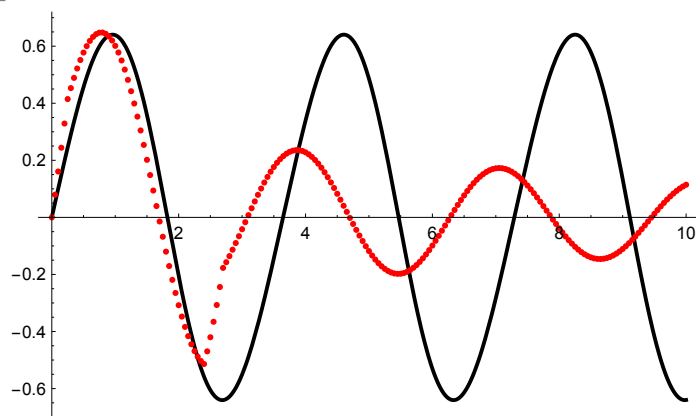
Out[1557]=



In[1548]:=

**Show[plotX, plotImpeulerX, PlotRange -> All]**

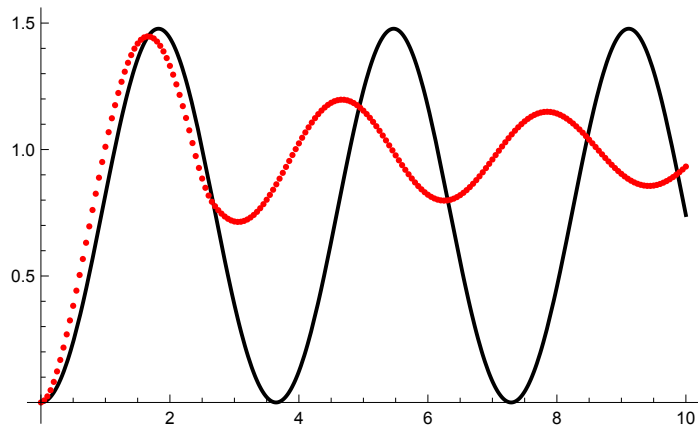
Out[1548]=



In[1549]:=

**Show[plotY, plotImpeulerY, PlotRange → All]**

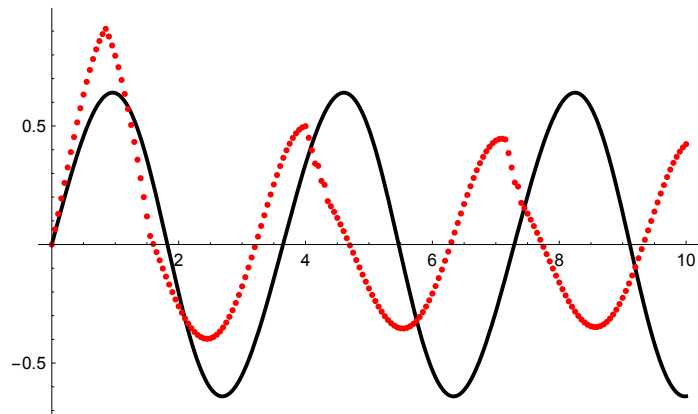
Out[1549]=



In[1550]:=

**Show[plotX, plotSymmetricX, PlotRange → All]**

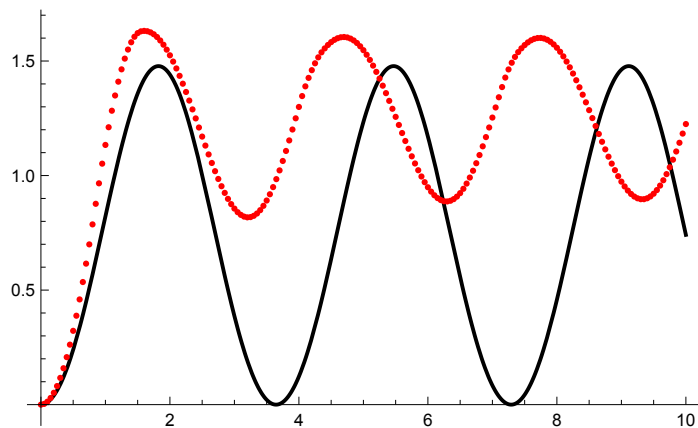
Out[1550]=



In[1551]:=

**Show[plotY, plotSymmetricY, PlotRange → All]**

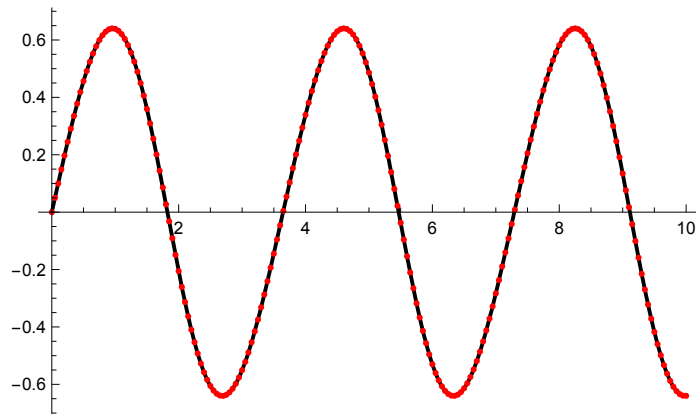
Out[1551]=



```
In[1552]:=
```

```
Show[plotX, plotAdamsX, PlotRange → All]
```

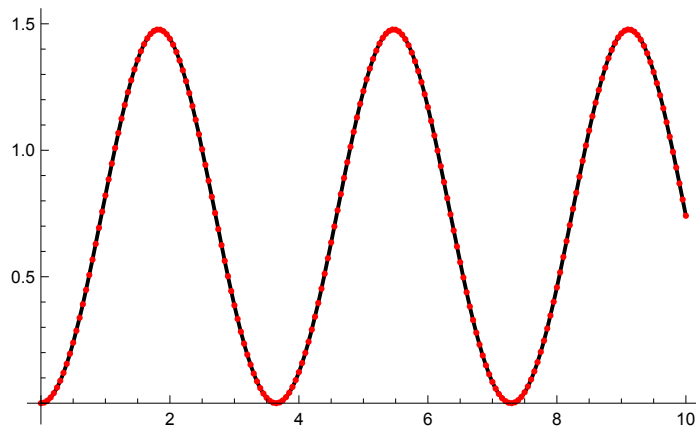
```
Out[1552]=
```



```
In[1553]:=
```

```
Show[plotY, plotAdamsY, PlotRange → All]
```

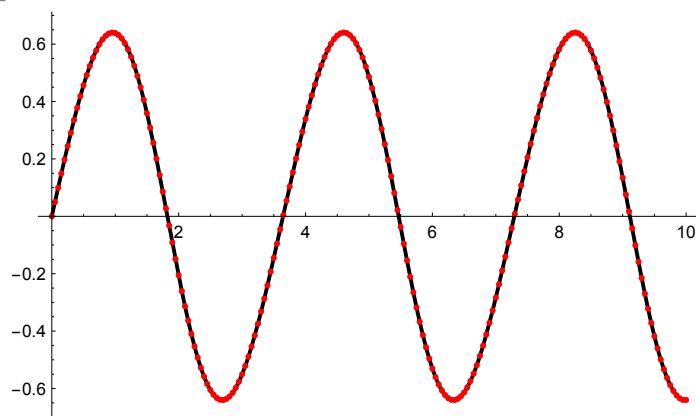
```
Out[1553]=
```



```
In[1554]:=
```

```
Show[plotX, plotPredictorX, PlotRange → All]
```

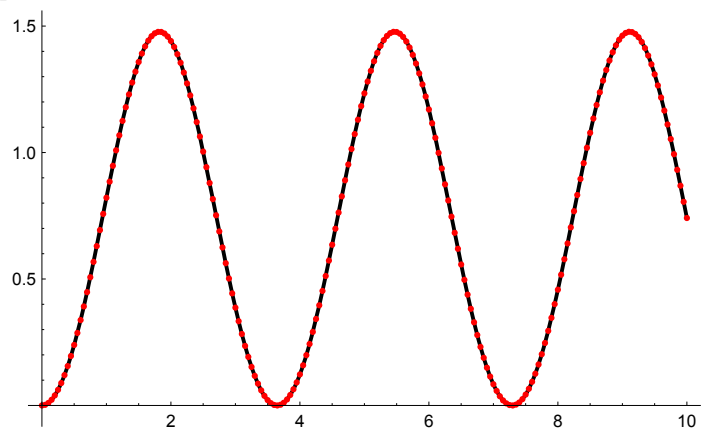
```
Out[1554]=
```



```
In[1555]:=
```

```
Show[plotY, plotPredictorY]
```

```
Out[1555]=
```



```
In[1556]:=
```