First-order Euler method for the SHO

stepsize

In[1]:=
```
h = .01;
```

number of steps

In[2]:=
```
n = 1000;
```

Guess for energy

In[29]:=
```
ϵ = 0.90;
```

In[17]:=
```
ϵ = 1.004;
```

In[3]:=
```
ϵ = 1.0056564;
```

In[35]:=
```
ϵ = 1.006;
```

In[36]:=
```
u = 0;
```

Look for odd solutions

In[5]:=
```
y1 = 0;
y2 = 1;
```

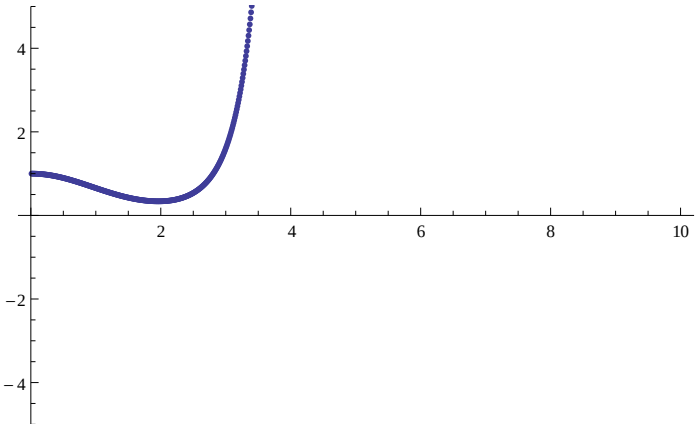
Look for even solutions

In[37]:=
```
y1 = 1;
y2 = 0;
```

In[39]:=
```
For[i = 1, i <= n, i++,
 u = u + h;
 y1 = y1 + h * y2;
 y2 = y2 + h * (u^2 - ϵ) * y1;
 a[i] = u; b[i] = y1;
]
```

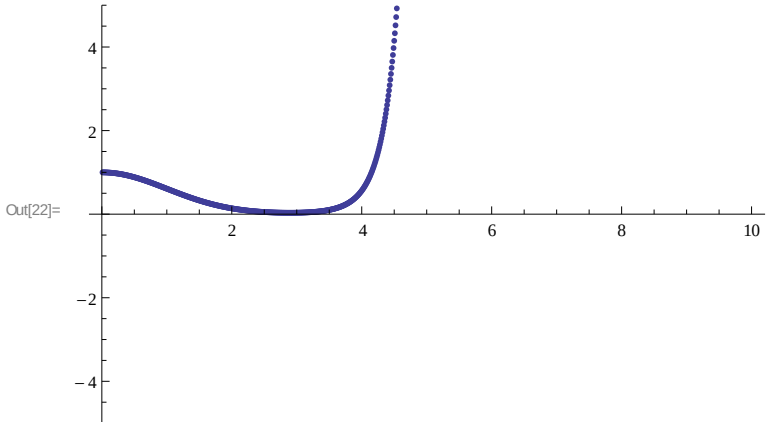
In[34]:=
```
ListPlot[Table[{a[i], b[i]}, {i, 1, n}], PlotRange → {-5, 5}]
```

Out[34]=



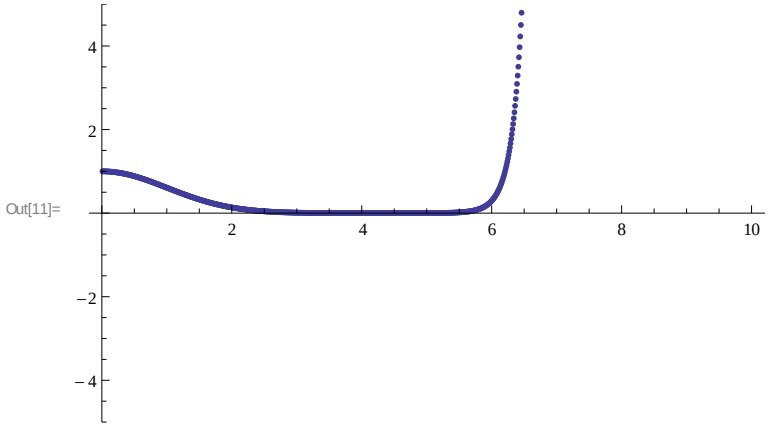
In[22]:=
```
ListPlot[Table[{a[i], b[i]}, {i, 1, n}], PlotRange → {-5, 5}]
```

Out[22]=



In[11]:=
```
ListPlot[Table[{a[i], b[i]}, {i, 1, n}], PlotRange → {-5, 5}]
```

Out[11]=



In[40]:=
```
ListPlot[Table[{a[i], b[i]}, {i, 1, n}], PlotRange → {-5, 5}]
```

Out[40]=