

```
In [1]: using Plots, LinearAlgebra
```

Nonlinear direction field

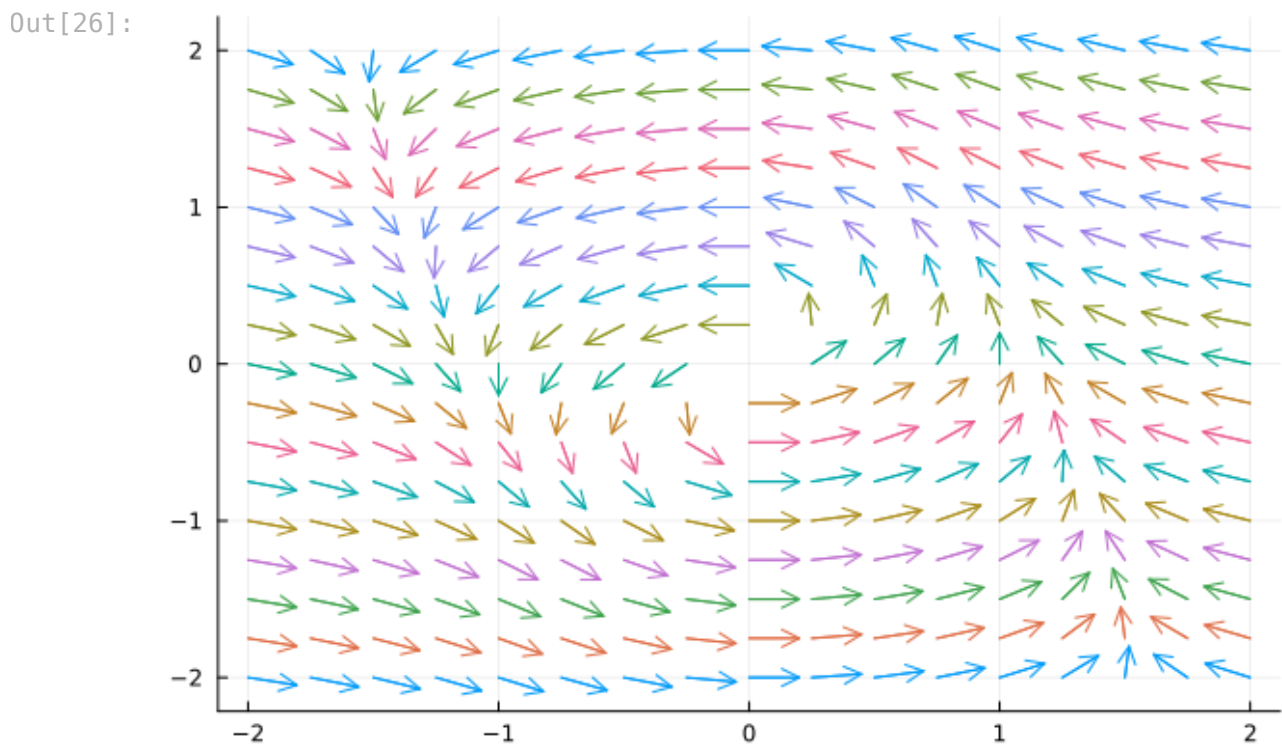
```
In [2]: L=1  
C=1  
F(i,vc)=[1/L*(-vc-i^3+i),i/C]
```

```
Out[2]: F (generic function with 1 method)
```

```
In [3]: F(0,0)
```

```
Out[3]: 2-element Vector{Float64}:  
 0.0  
 0.0
```

```
In [26]: xs=-2:0.25:2  
ys=-2:0.25:2  
P1=quiver(  
xs*ones(length(ys))',  
ones(length(xs))*ys',  
quiver=(x,y)->F(x,y)/norm(F(x,y))*0.2,  
)
```



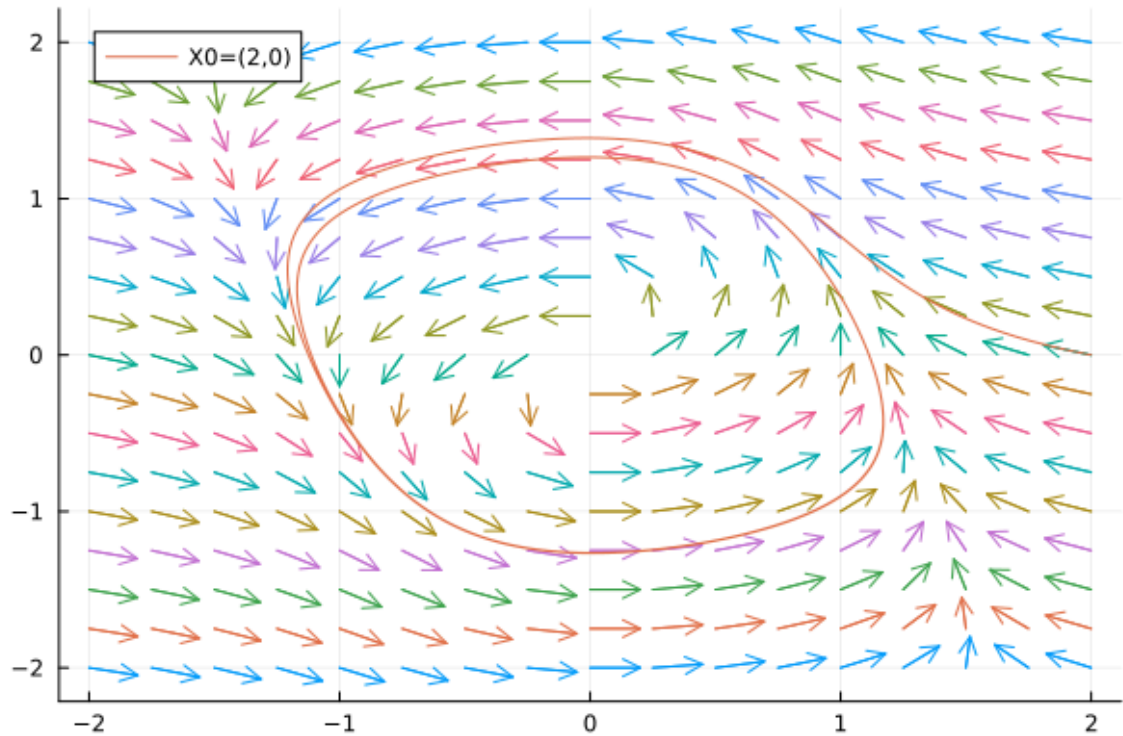
Use Euler's explicit method

$$X_{n+1} = X_n + hF(X_n)$$

```
In [16]: X0=[2.0,0]; h=1/64
Xn=X0
Xtraj=[X0]
for n=1:10000
    Xn=Xn+h*F(Xn...)
    push!(Xtraj,Xn)
end
```

```
In [28]: plot!(first.(Xtraj),last.(Xtraj),label="X0=(2,0)")
```

Out[28]:



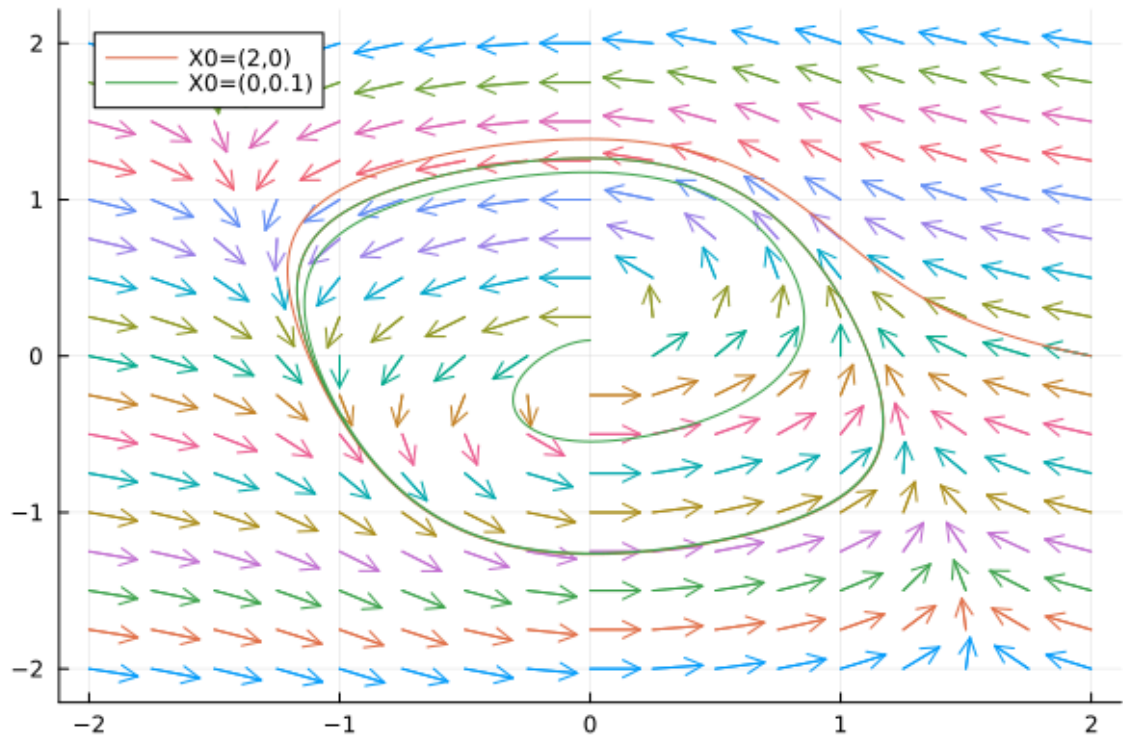
```
In [29]: function mktraj(X0)
    h=1/64
    Xn=X0
    Xtraj=[X0]
    for n=1:10000
        Xn=Xn+h*F(Xn...)
        push!(Xtraj,Xn)
    end
    return Xtraj
end
```

Out[29]: mktraj (generic function with 1 method)

```
In [30]: Xtraj2=mktraj([0,0.1]);
```

```
In [31]: plot!(first.(Xtraj2),last.(Xtraj2),label="X0=(0,0.1)")
```

Out[31]:



In []: