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

Nonlinear direction field

In [19]:
```
L=1
C=1/3
F(i,vc)=[1/L*(-vc-i^3+i),i/C]
```

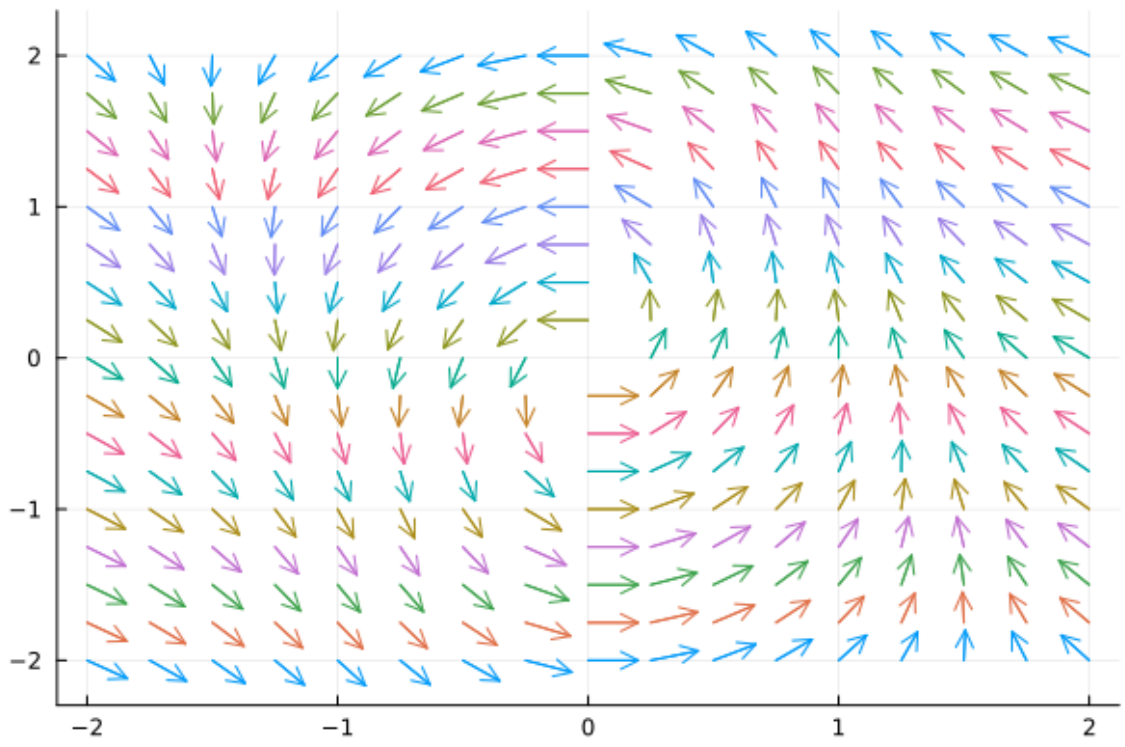
Out[19]:
```
F (generic function with 1 method)
```

In [20]:
```
F(0,0)
```

Out[20]:
```
2-element Vector{Float64}:
 0.0
 0.0
```

In [21]:
```
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,
)
```

Out[21]:



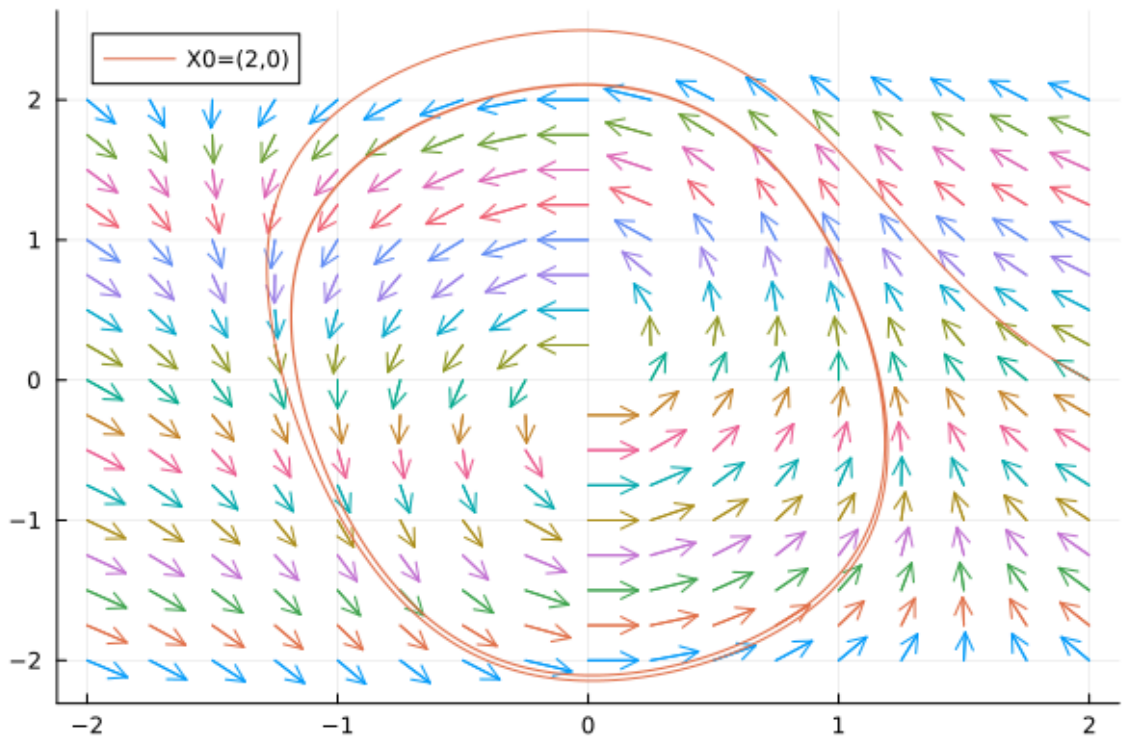
Use Euler's explicit method

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

In [22]:
```
X0=[2.0,0]; h=1/64
Xn=X0
Xtraj=[X0]
for n=1:100000
    Xn=Xn+h*F(Xn...)
    push!(Xtraj,Xn)
end
```

In [23]:
```
plot!(first.(Xtraj),last.(Xtraj),label="X0=(2,0)")
```

Out[23]:



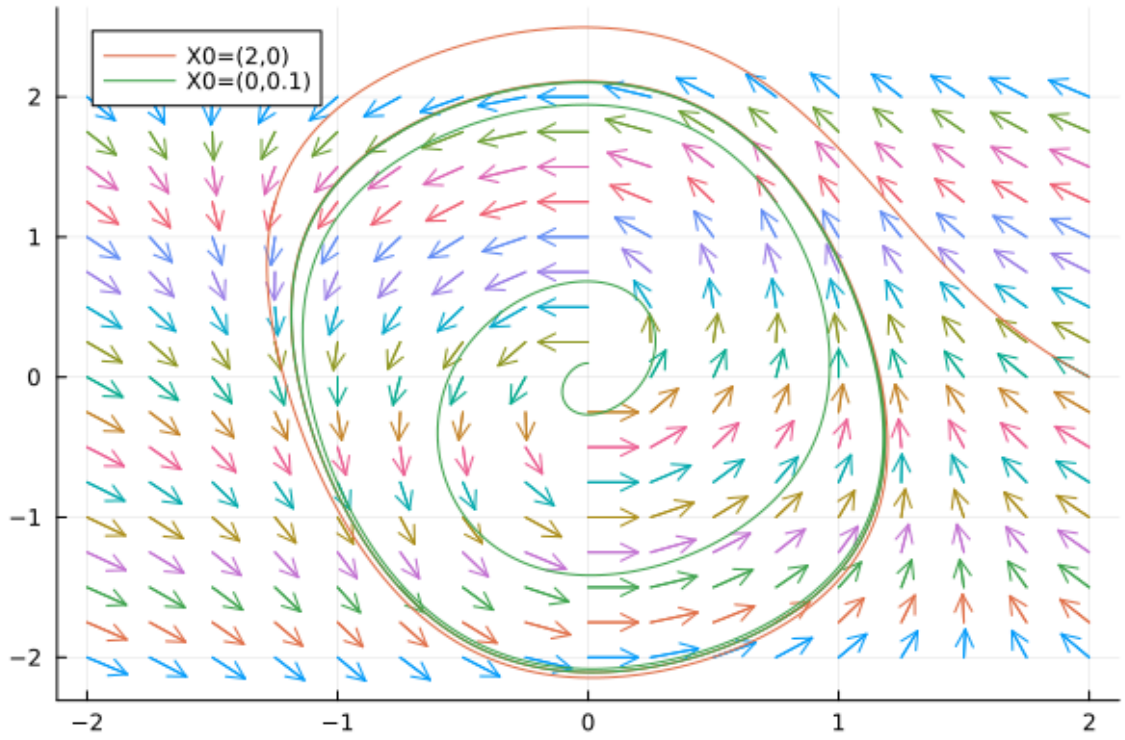
In [24]:
```
function mktraj(X0)
    h=1/64
    Xn=X0
    Xtraj=[X0]
    for n=1:10000
        Xn=Xn+h*F(Xn...)
        push!(Xtraj,Xn)
    end
    return Xtraj
end
```

Out[24]:
```
mktraj (generic function with 1 method)
```

In [25]:
```
Xtraj2=mktraj([0,0.1]);
```

In [26]:
```
plot!(first.(Xtraj2),last.(Xtraj2),label="X0=(0,0.1)")
```

Out[26]:



In [ ]: