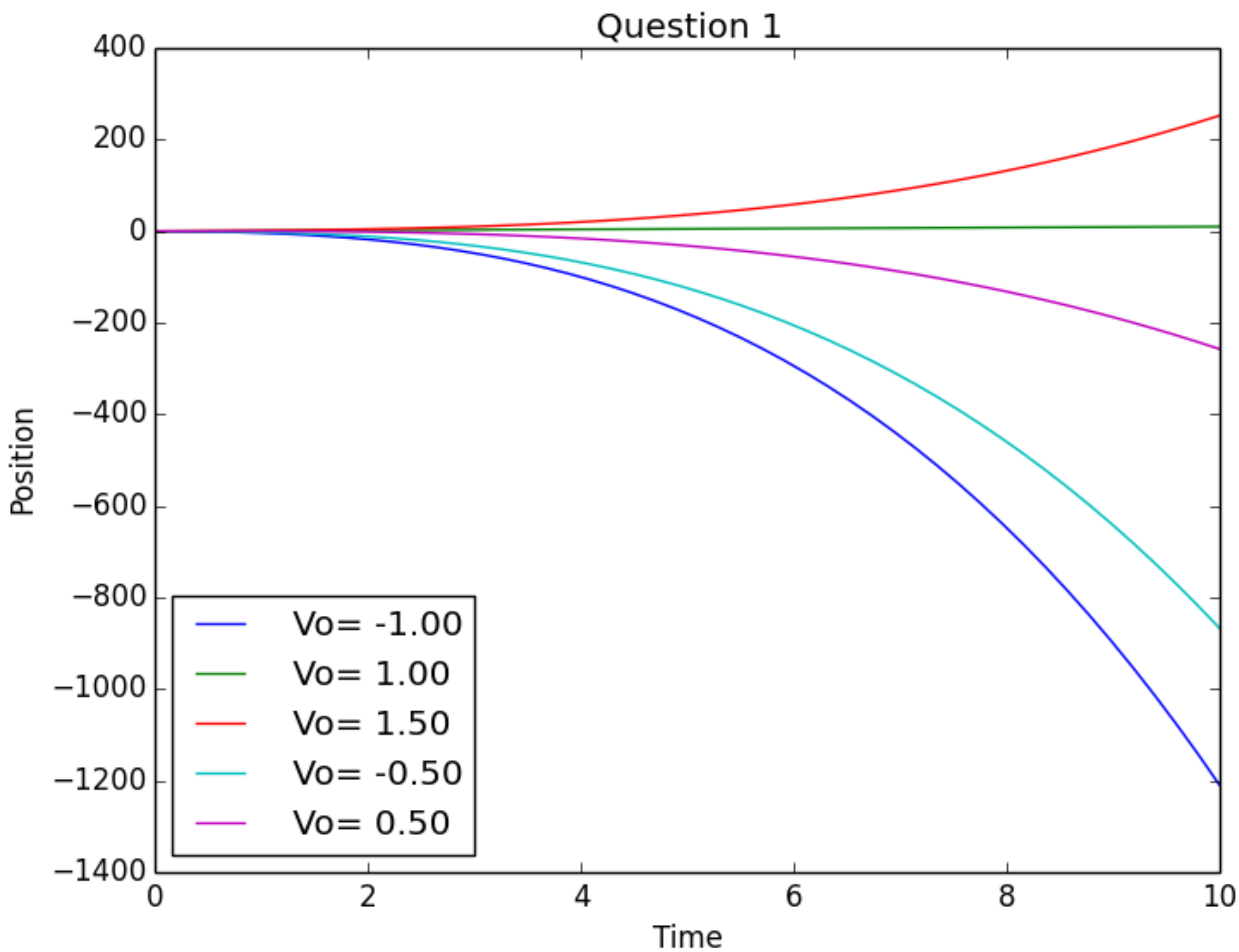
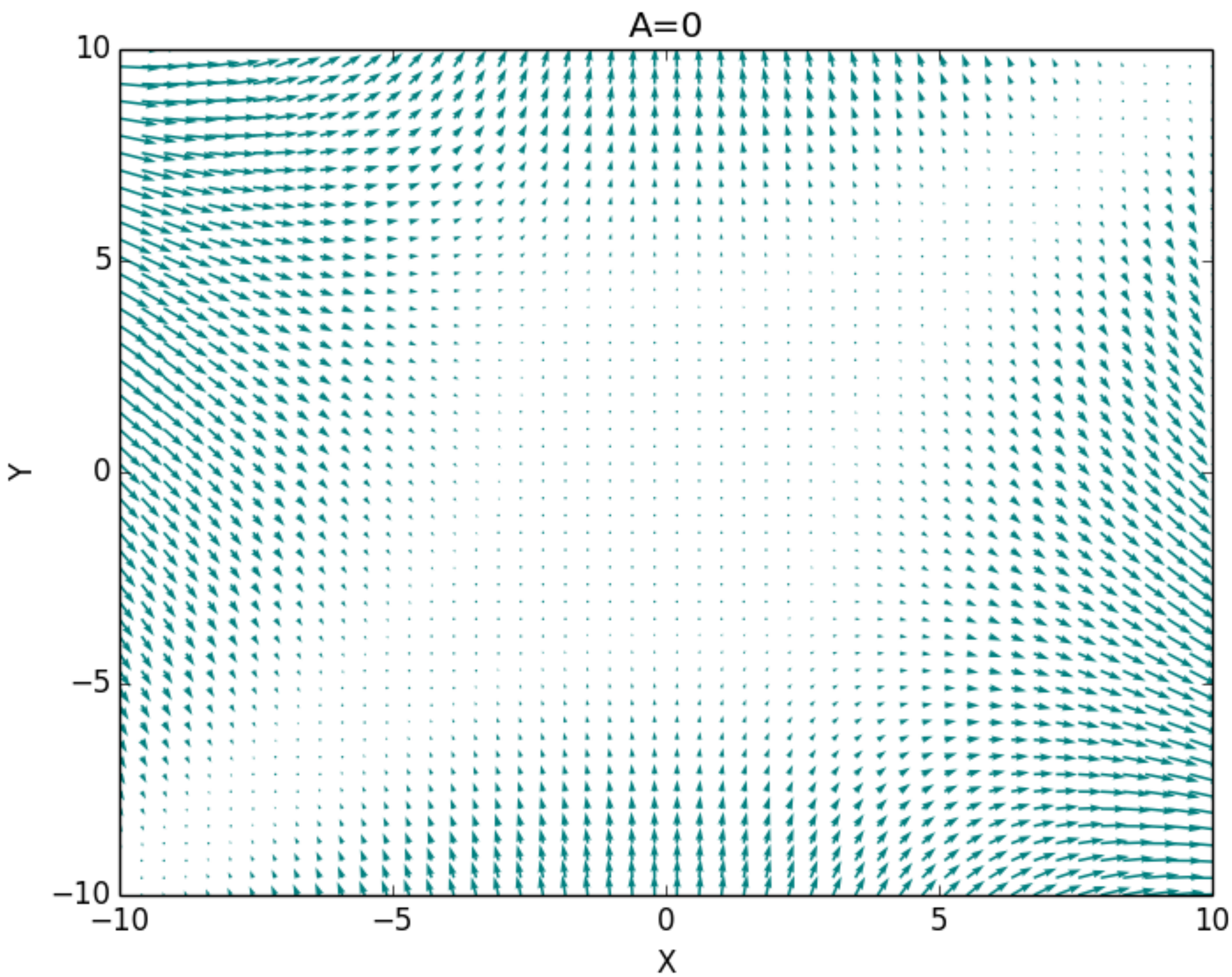
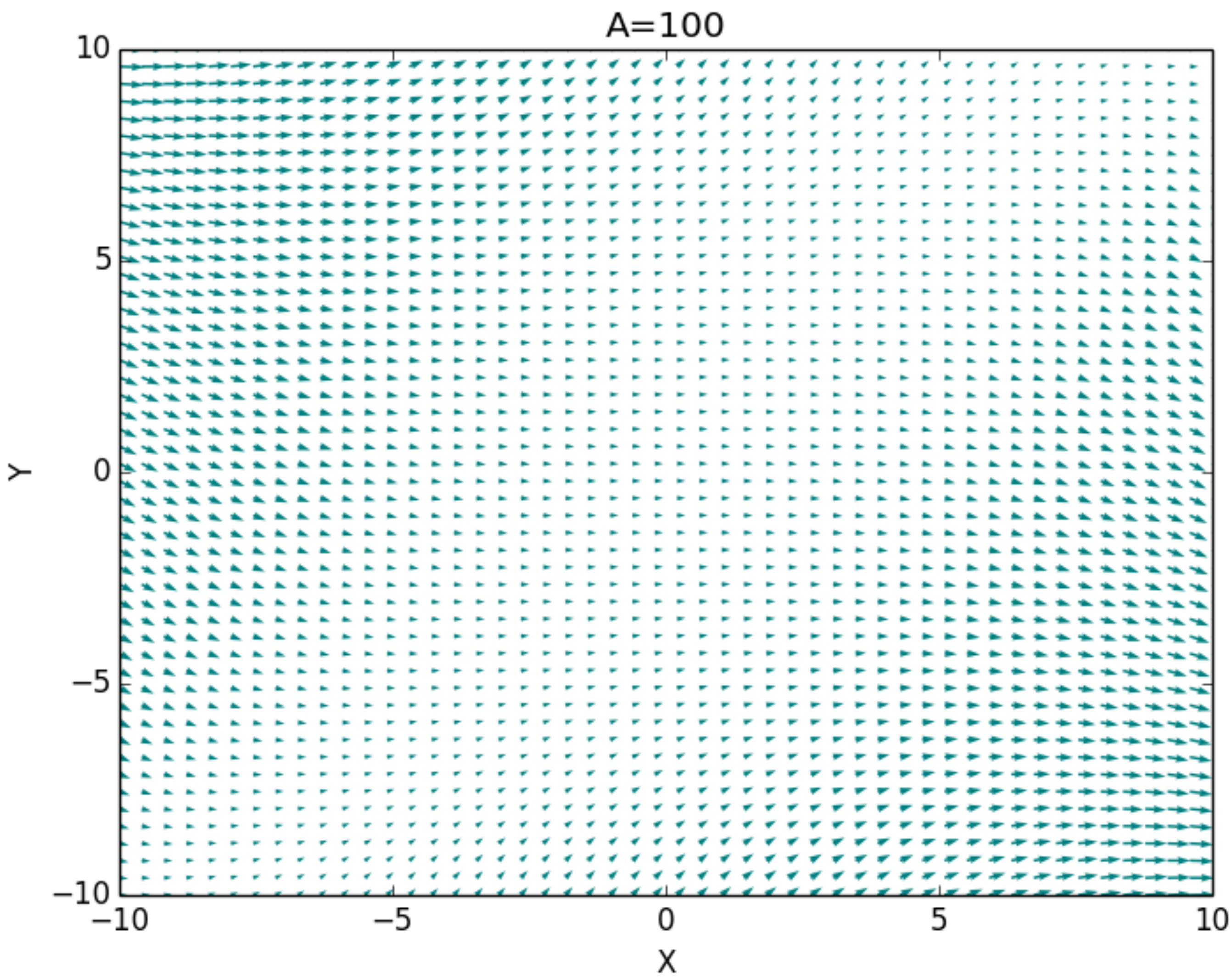
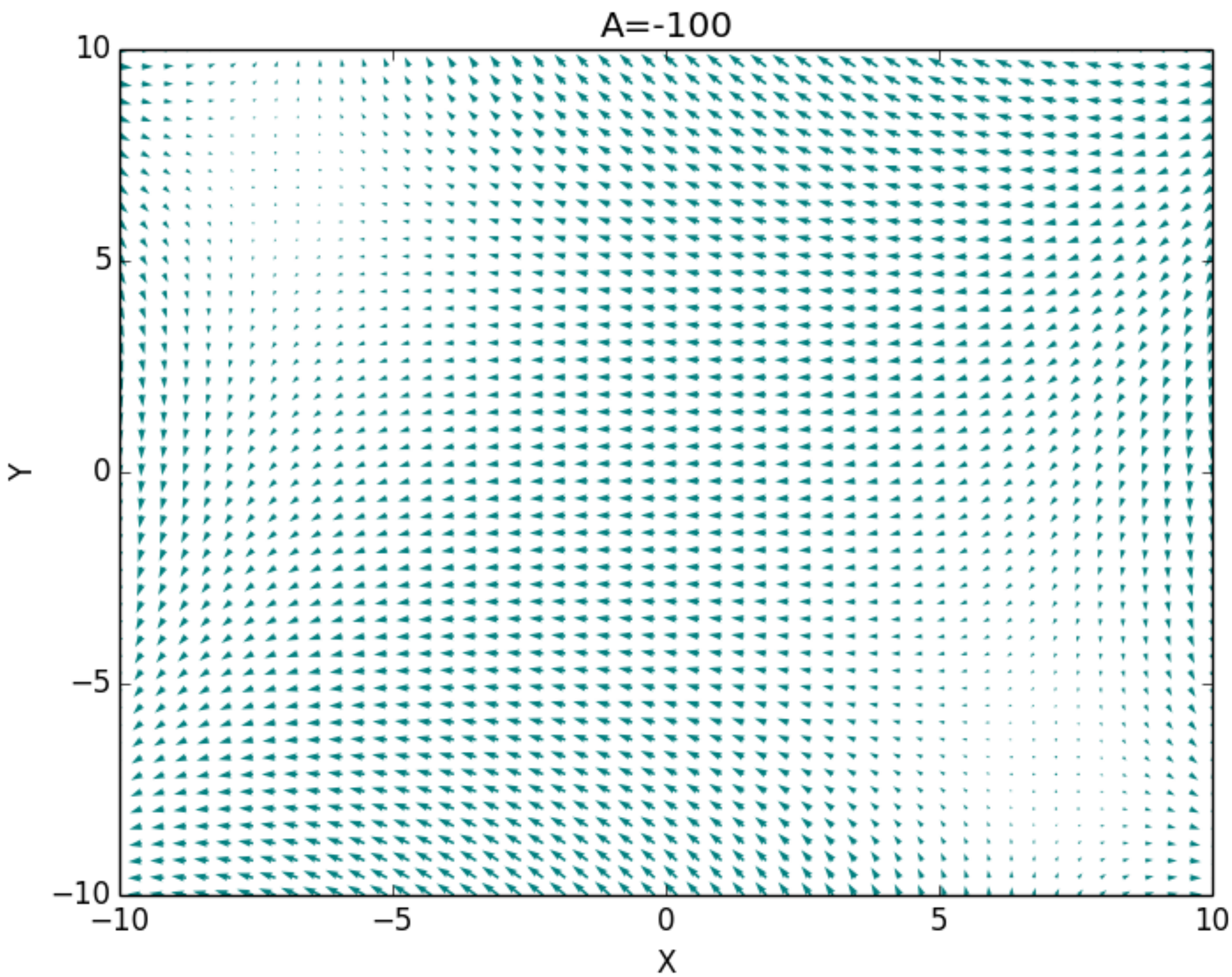

Question 1
Position
Time
400
200
0
−200
−400
−600
−800
−1000
−1200
−1400
0
2
4
6
8
10
Vo= -1.00
Vo= 1.00
Vo= 1.50
Vo= -0.50
Vo= 0.50

```python
"""
The steady state velocity will be when xdot is equal to Vo (the velocity is unchanging)
the first term vanishes and the stability can be analyzed by looking at the derivative
with respect to velocity.
The derivative is relatively easy:
0=-2(xdot-1)
Thus this is quantity is <0 for xdot>1 (and therefore stable)
and >0 for x<1  (and therefore unstable)

"""
##note the resulting graph is not quite what I expected for position vs time, so I suspect I have made an error somewhere##


import numpy as np
import matplotlib.pyplot as plt
import decimal

##governing equations of motion dependent on initial velocity, position and time
def motion(vo,x,t):
        a=(vo*t-x)-(vo-1)**2     ##given accel equation
        x=vo*t+(a*(t**2))/2      ##kinematics equation for position
        plt.plot(t,x,label=' Vo= %.2f' %(vo))

x=np.linspace(0,10)
t=np.linspace(0,10)

##plot/call the function for different values of velocity
motion(-1,x,t)
motion(1,x,t)
motion(1.5,x,t)
motion(-.5,x,t)
motion(.5,x,t)
plt.xlabel("Time")
plt.ylabel("Position")
plt.title("Question 1")
plt.legend(loc='lower left')
plt.show()

```


A=0
10
5
0
−5
−10
Y
−10
−5
0
5
10
X



A=100
10
5
0
−5
−10
Y
−10
−5
0
5
10
X


A=-100
10
5
0
−5
−10
−10
−5
0
5
10
Y
X

```python
import matplotlib.pyplot as plt
import numpy as np

x=np.linspace(-10,10)
y=np.linspace(-10,10)

W,Z=np.meshgrid(x,y)
#X=np.meshgrid(-10:10)
#Y=np.meshgrid(-10:10)

a=0
xdot=a+W**2-(W*Z)
ydot=Z**2-W**2-1


#fig,ax=plt.subplots()
#q=ax.quiver(W,Z)
#ax.quiverkey(q,X=0.3,Y=1.1,U=10,label='key',labelpos='E')

plt.quiver(W,Z,xdot,ydot,color='Teal',headlength=5)
plt.title("A=0")
plt.xlabel("X")
plt.ylabel("Y")
plt.show()
```