Computer assignment 2

Use Python to draw a direction field for the system of differential equations

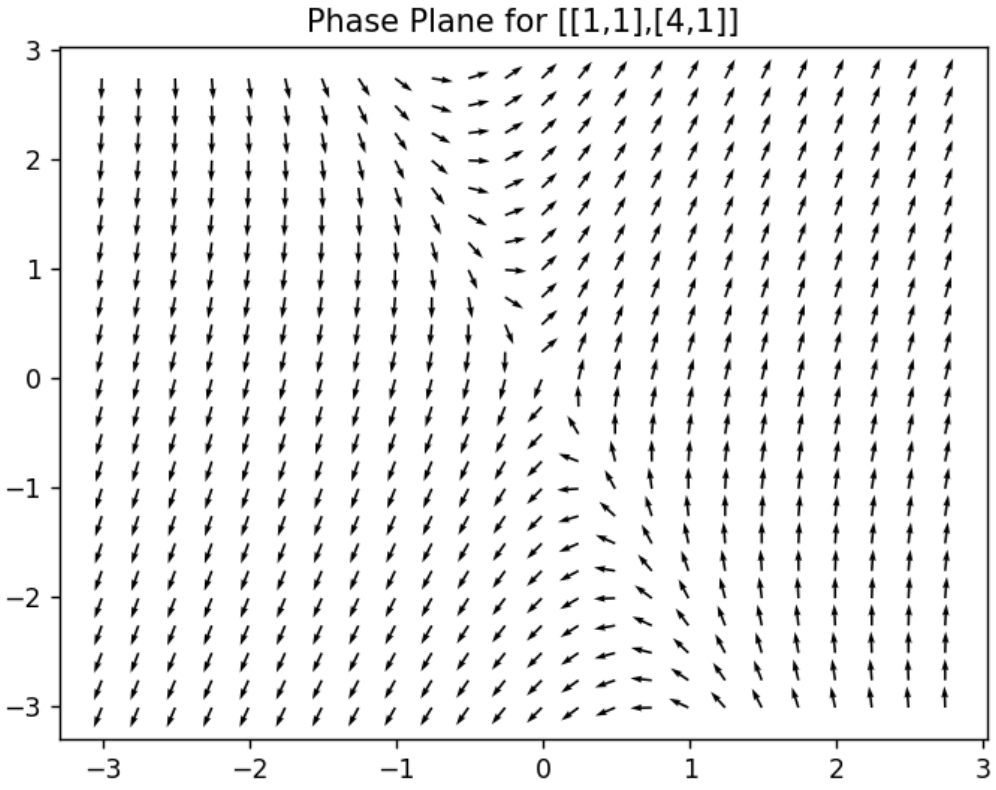
$$\mathbf{x}' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} \mathbf{x}.$$

Use a $[-3, 3]$ by $[-3, 3]$ grid.

In [1]:
```
from sympy import *
```

In [2]:
```
matplotlib notebook
```

In [4]:
```
import numpy as np #NOTE: Since we already imported from sympy, we will use a shortcut
import matplotlib.pyplot as plt
X1, X2 = np.meshgrid(np.arange(-3.01, 2.99, .25), np.arange(-3.01, 2.99, .25)) # adjus
X1p = 1*X1+1*X2
X2p = 4*X1+1*X2
#Normalize the arrows by dividing by their magnitude (focus on direction)
U=1/(X1p**2+X2p**2)**(0.5)*X1p
V=1/(X1p**2+X2p**2)**(0.5)*X2p
plt.figure()
plt.title('Phase Plane for [[1,1],[4,1]]')
Q = plt.quiver(X1, X2, U, V) # draws the normalized arrows at (X,Y) with slope dYdX
```



In [ ]:
```
```

In [1]:
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from sympy import *
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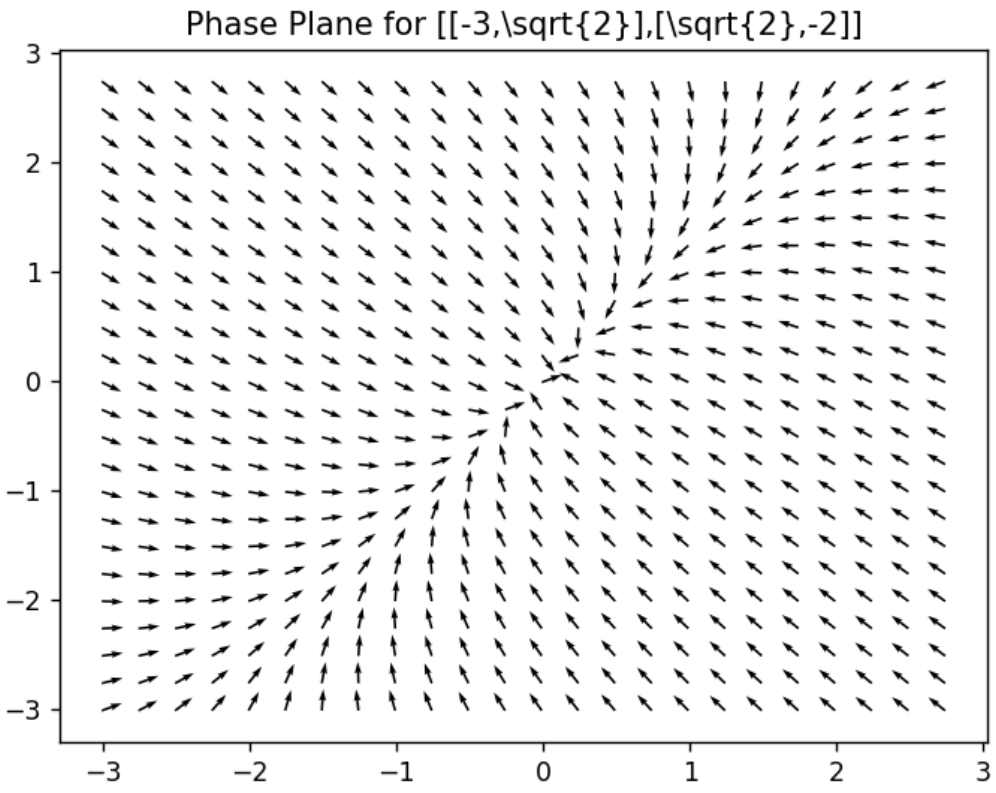
In [2]:
```
matplotlib notebook
```

In [8]:
```
import numpy as np #NOTE: Since we already imported from sympy, we will use a shortcut
import matplotlib.pyplot as plt
X1, X2 = np.meshgrid(np.arange(-3.01, 2.99, .25), np.arange(-3.01, 2.99, .25)) # adjus
X1p = -3*X1+2**.5*X2
X2p = 2**.5*X1-2*X2
#Normalize the arrows by dividing by their magnitude (focus on direction)
U=1/(X1p**2+X2p**2)**(0.5)*X1p
V=1/(X1p**2+X2p**2)**(0.5)*X2p
plt.figure()
plt.title('Phase Plane for [[-3,\sqrt{2}],[\sqrt{2},-2]]')
Q = plt.quiver(X1, X2, U, V) # draws the normalized arrows at (X,Y) with slope dYdX
```



In [ ]:
```

```