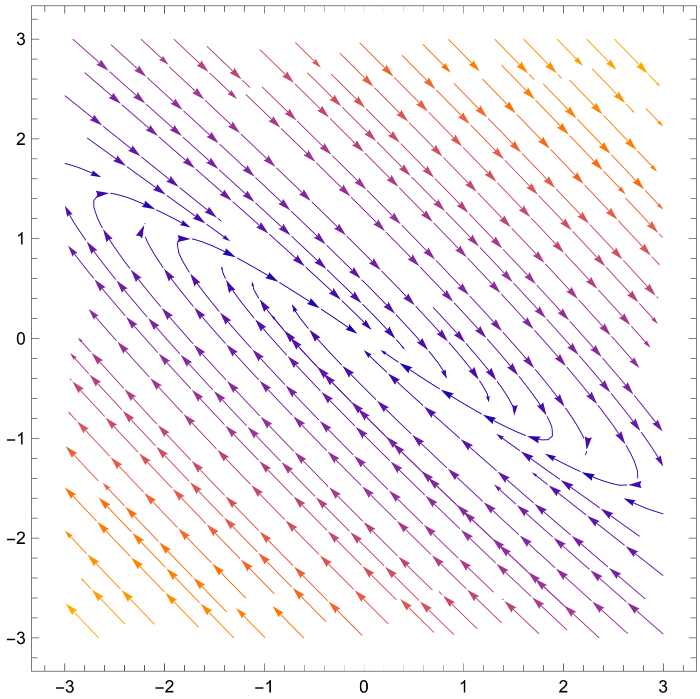
# 1.2a)

In[10]:=
```
sigma = -1
StreamPlot[{(sigma + 3) x + 4 y, (-9 / 4) x + (sigma - 3) y}, {x, -3, 3}, {y, -3, 3}]
```

Out[10]=

-1

Out[11]=

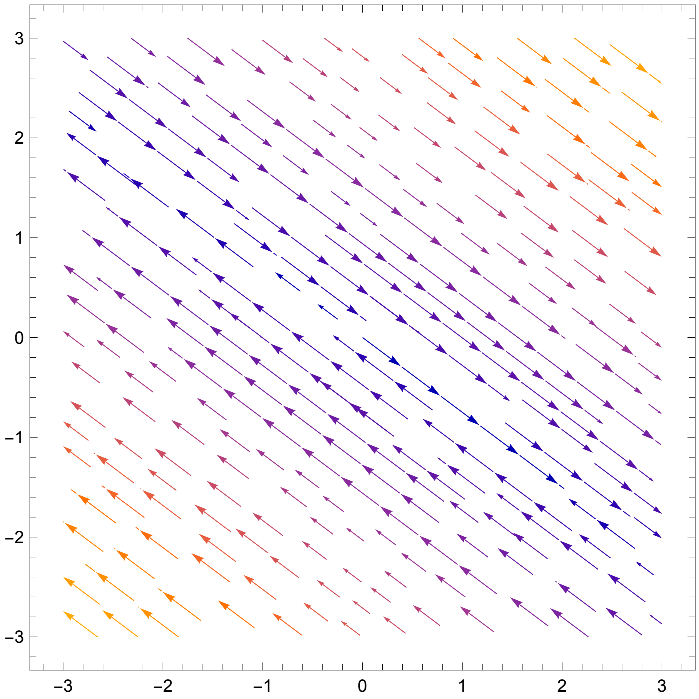


In[3]:= sigma = 0

StreamPlot[{(sigma + 3) x + 4 y, (-9 / 4) x + (sigma - 3) y}, {x, -3, 3}, {y, -3, 3}]

Out[3]= 0

Out[4]=

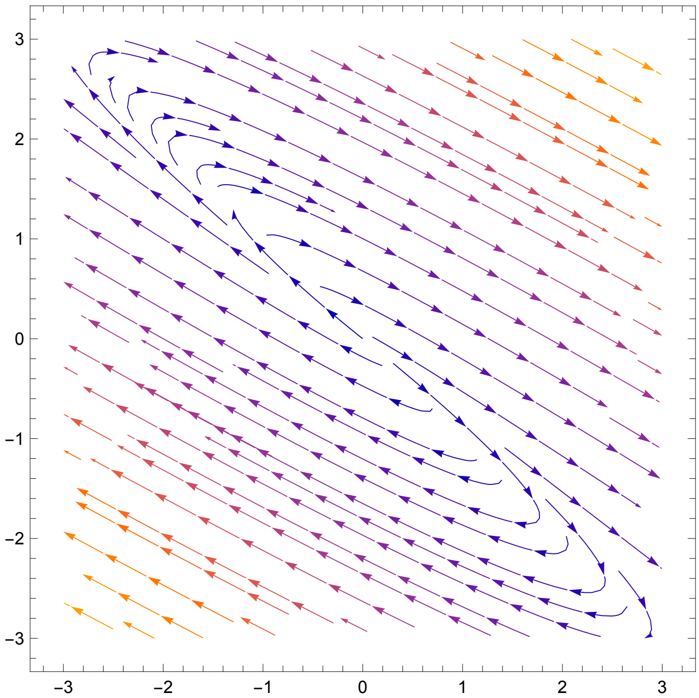


In[5]:= sigma = 1

StreamPlot[{(sigma + 3) x + 4 y, (-9 / 4) x + (sigma - 3) y}, {x, -3, 3}, {y, -3, 3}]

Out[5]= 1

Out[6]=



# 1.2 b)

```
matrix = {{σ + 3, 4}, {-9 / 4, σ - 3}}
```

```
In[31]:= matrix = {{σ + 3, 4}, {-9 / 4, σ - 3}};
```

12.1c)

In[33]:= vectors = Eigenvectors$\left[\left\{\{3 + \sigma, 4\}, \left\{-\frac{9}{4}, -3 + \sigma\right\}\right\}\right]$

Out[33]=

$$\left\{\left\{-\frac{4}{3}, 1\right\}, \{0, 0\}\right\}$$

```
In[37]:= eigenVector = vectors[[1]]
```

Out[37]=

$$\left\{-\frac{4}{3}, 1\right\}$$

```
In[38]:= magnitude = Sqrt[Total[eigenVector ^ 2]];
In[41]:= normalizedVector = -eigenVector / magnitude
```

Out[41]=

$$\left\{\frac{4}{5}, -\frac{3}{5}\right\}$$

12.1 d)

```
In[42]:= Inverse[matrix]
```

Out[42]=

$$\left\{\left\{\frac{-12 + 4\sigma}{4\sigma^2}, -\frac{4}{\sigma^2}\right\}, \left\{\frac{9}{4\sigma^2}, \frac{3 + \sigma}{\sigma^2}\right\}\right\}$$

12.1 e)

when sigma =0 inverse of A goes to inf therfor sigma =0 implies that invers of A dosent excist in this particular case (sigma =0)

12.1 f)

In[47]:=
```
matrixGeneral={{σ-cd,d^2},{-c^2,σ+cd}}
matrixSigmaMinus={{-1-cd,d^2},{-c^2,-1+cd}}
```

Out[47]=

$$\{\{-cd+\sigma, d^2\}, \{-c^2, cd+\sigma\}\}$$

Out[48]=

$$\{\{-1-cd, d^2\}, \{-c^2, -1+cd\}\}$$

In[50]:=
```
Eigensystem[matrixSigmaMinus]
```

Out[50]=

$$\left\{\left\{-1-\sqrt{cd^2-c^2 d^2}, -1+\sqrt{cd^2-c^2 d^2}\right\}, \left\{\left\{-\frac{-cd-\sqrt{cd^2-c^2 d^2}}{c^2}, 1\right\}, \left\{-\frac{-cd+\sqrt{cd^2-c^2 d^2}}{c^2}, 1\right\}\right\}\right\}$$

In[52]:=
```
Eigenvalues[matrixSigmaMinus]
```

Out[52]=

$$\left\{-1-\sqrt{cd^2-c^2 d^2}, -1+\sqrt{cd^2-c^2 d^2}\right\}$$

In[51]:=
```
Eigenvectors[matrixSigmaMinus]
```

Out[51]=

$$\left\{\left\{-\frac{-cd-\sqrt{cd^2-c^2 d^2}}{c^2}, 1\right\}, \left\{-\frac{-cd+\sqrt{cd^2-c^2 d^2}}{c^2}, 1\right\}\right\}$$

Eigenvalues should be the same as previous [sigma,sigma] (sigma=-1) therfore sqrt(cd^2-c^2d^2)=0 . Given this the eigenvector is [d/c,1].