

Eigenvalueus and Eigenvectors

The eigenvalues of a triangular matrix

```
In[6]:= Eigensystem $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$ 
```

```
Out[6]= {{2, 1}, {{0, 1}, {-1, 1}}}
```

```
In[8]:= Eigensystem $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 2 & 0 \\ 2 & 1 & 3 \end{bmatrix}$ 
```

```
Out[8]= {{3, 2, 1}, {{0, 0, 1}, {0, -1, 1}, {-2, -2, 3}}}
```

```
In[9]:= Eigensystem $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 1 & 4 \end{bmatrix}$ 
```

```
Out[9]= {{4, 2, 2}, {{0, 0, 1}, {0, -2, 1}, {1, 0, 0}}}
```

Eigenvalues, eigenvectors of 2x2

```
In[11]:= Eigensystem $\begin{bmatrix} 18 & -2 \\ 12 & 7 \end{bmatrix}$ 
```

```
Out[11]= {{15, 10}, {{2, 3}, {1, 4}}}
```

Question 10

```
In[21]:= Aa =  $\begin{pmatrix} 3 & -2 \\ 4 & -1 \end{pmatrix}$ ;
```

```
Ab =  $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ ;
```

```
Ac =  $\begin{pmatrix} \text{Cos}[\theta] & -\text{Sin}[\theta] \\ \text{Sin}[\theta] & \text{Cos}[\theta] \end{pmatrix}$ ;
```

```
set = {Aa, Ab, Ac};
```

```
In[45]:= Map[Det, set]
```

```
Out[45]= {5, 1, Cos[ $\theta$ ]2 + Sin[ $\theta$ ]2}
```

```
In[27]:= Map[Tr, set]
```

```
Out[27]= {2, 0, 2 Cos[ $\theta$ ]}
```

Question 11.

```
In[66]:= Map[Eigenvalues, set]
```

```
Out[66]= {{1 + 2 i, 1 - 2 i}, {i, -i}, {Cos[ $\theta$ ] - i Sin[ $\theta$ ], Cos[ $\theta$ ] + i Sin[ $\theta$ ]}}
```

Question 16.

```
In[67]:= Map[Eigenvectors, set]
```

```
Out[67]= {{1 + i, 2}, {1 - i, 2}}, {{i, 1}, {-i, 1}}, {{-i, 1}, {i, 1}}}
```