

In[]:= $\mathbf{A} = \begin{pmatrix} -8 & \frac{3}{4} & -2 \\ 0 & -2 & 0 \\ 0 & -\frac{3}{2} & -4 \end{pmatrix}$

Out[]:=

$\left\{ \left\{ -8, \frac{3}{4}, -2 \right\}, \{0, -2, 0\}, \left\{ 0, -\frac{3}{2}, -4 \right\} \right\}$

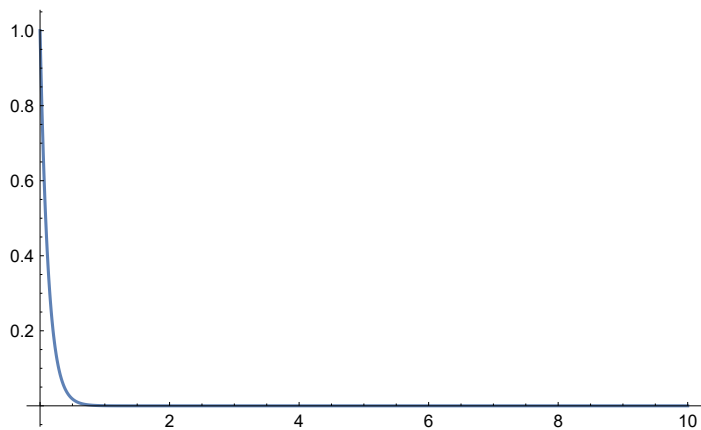
In[]:= $\lambda = \text{Eigenvalues}[\mathbf{A}]$

Out[]:=

$\{-8, -4, -2\}$

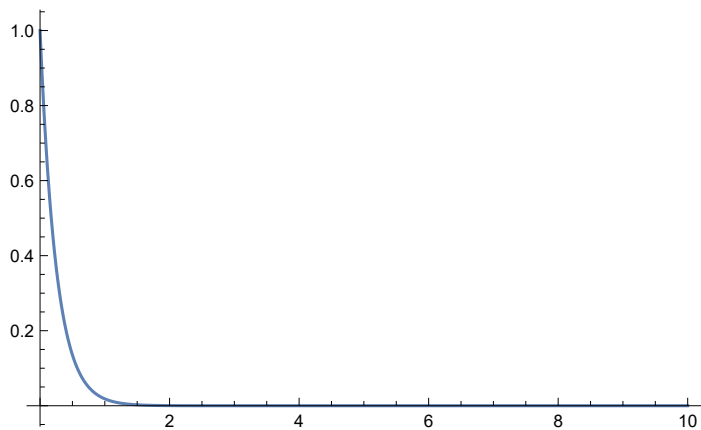
In[]:= $\text{Plot}[e^{-8t}, \{t, 0, 10\}, \text{PlotRange} \rightarrow \text{All}]$

Out[]:=



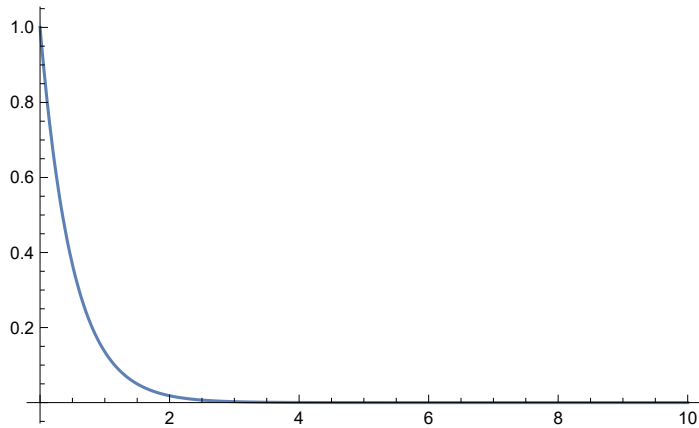
In[]:= $\text{Plot}[e^{-4t}, \{t, 0, 10\}, \text{PlotRange} \rightarrow \text{All}]$

Out[]:=



```
In[*]:= Plot[E-2t, {t, 0, 10}, PlotRange → All]
```

```
Out[*]=
```



```
In[*]:= N[Exp[-1]]
```

```
Out[*]=
```

0.367879

```
In[*]:= T = Transpose[Eigenvectors[A]]
```

```
Out[*]=
```

$$\left\{ \left\{ 1, -\frac{1}{2}, -\frac{1}{2} \right\}, \left\{ 0, 0, -\frac{4}{3} \right\}, \left\{ 0, 1, 1 \right\} \right\}$$

```
In[*]:= T // MatrixForm
```

```
Out[*]//MatrixForm=
```

$$\begin{pmatrix} 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & -\frac{4}{3} \\ 0 & 1 & 1 \end{pmatrix}$$

```
In[*]:= x0 = {{3}, {-2}, {0}}
```

```
Out[*]=
```

$$\{\{3\}, \{-2\}, \{0\}\}$$

```
In[*]:= z0 = Inverse[T].x0
```

```
Out[*]=
```

$$\left\{ \{3\}, \left\{ -\frac{3}{2} \right\}, \left\{ \frac{3}{2} \right\} \right\}$$

```
In[*]:= {n, n} = Dimensions[A]
```

```
Out[*]=
```

$$\{3, 3\}$$

```
In[*]:= x1[t_] := Sum[T[[All, i]] eλit z0[[i, 1]], {i, 1, n}]
```

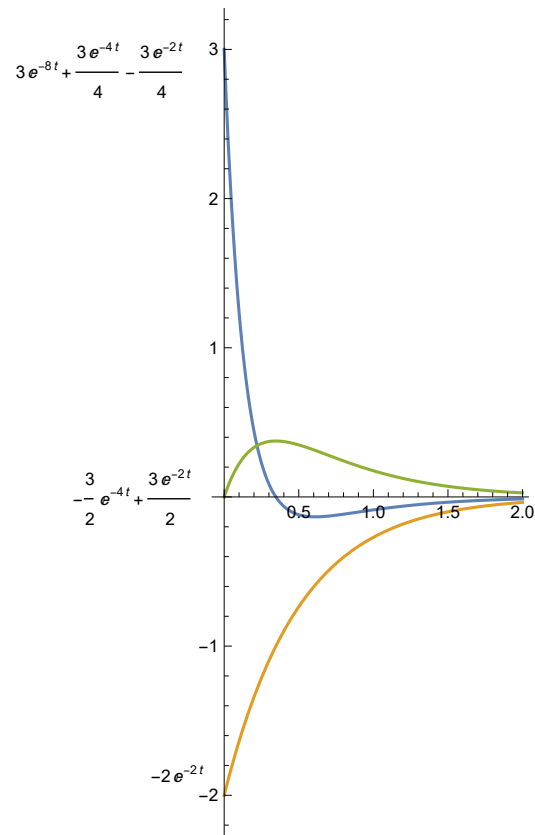
```
In[*]:= x1[t] // MatrixForm
```

```
Out[*]//MatrixForm=
```

$$\begin{pmatrix} 3e^{-8t} + \frac{3e^{-4t}}{4} - \frac{3e^{-2t}}{4} \\ -2e^{-2t} \\ -\frac{3}{2}e^{-4t} + \frac{3e^{-2t}}{2} \end{pmatrix}$$

```
In[ ]:= Plot[Evaluate[x1[t]], {t, 0, 2}, PlotRange → All,
  AspectRatio → Automatic, PlotLabels → Placed[Automatic, Before]]
```

Out[]:=



```
In[ ]:= x0 = {{10}, {0}, {0}}
```

Out[]:=

```
{{10}, {0}, {0}}
```

```
In[ ]:= z0 = Inverse[T].x0
```

Out[]:=

```
{{10}, {0}, {0}}
```

```
In[ ]:= x1[t_] := ∑i=1n T[[All, i]] eλ[[i]] t z0[[i, 1]]
```

```
In[ ]:= x1[t] // MatrixForm
```

Out[]//MatrixForm=

$$\begin{pmatrix} 10 e^{-8t} \\ 0 \\ 0 \end{pmatrix}$$

```
In[ ]:= x0 = {{-1}, {-8/3}, {2}}
```

Out[]:=

```
{{-1}, {-8/3}, {2}}
```

```
In[ ]:= z0 = Inverse[T].x0
```

Out[]:=

```
{{0}, {0}, {2}}
```

$$\text{In}[*]:= \mathbf{x}_1[\mathbf{t}_-] := \sum_{i=1}^n \mathbf{T}[\mathbf{All}, i] e^{\lambda[i] \mathbf{t}} \mathbf{z}_0[i, 1]$$

In[*]:= $\mathbf{x}_1[\mathbf{t}]$ // MatrixForm

Out[*]//MatrixForm=

$$\begin{pmatrix} -e^{-2t} \\ -\frac{8}{3} e^{-2t} \\ 2 e^{-2t} \end{pmatrix}$$