In[∘]:= $A = \begin{pmatrix} \frac{9}{10} & \frac{-3}{10} & 1 \\ \frac{-7}{5} & \frac{4}{5} & -2 \\ \frac{-7}{5} & \frac{3}{10} & \frac{-3}{2} \end{pmatrix}$

Out[∘]=

$$\left\{\left\{\frac{9}{10}, -\frac{3}{10}, 1\right\}, \left\{-\frac{7}{5}, \frac{4}{5}, -2\right\}, \left\{-\frac{7}{5}, \frac{3}{10}, -\frac{3}{2}\right\}\right\}$$

In[∘]:= **MatrixForm[A]**

Out[∘]//MatrixForm=

$$\begin{pmatrix} \frac{9}{10} & -\frac{3}{10} & 1 \\ -\frac{7}{5} & \frac{4}{5} & -2 \\ -\frac{7}{5} & \frac{3}{10} & -\frac{3}{2} \end{pmatrix}$$

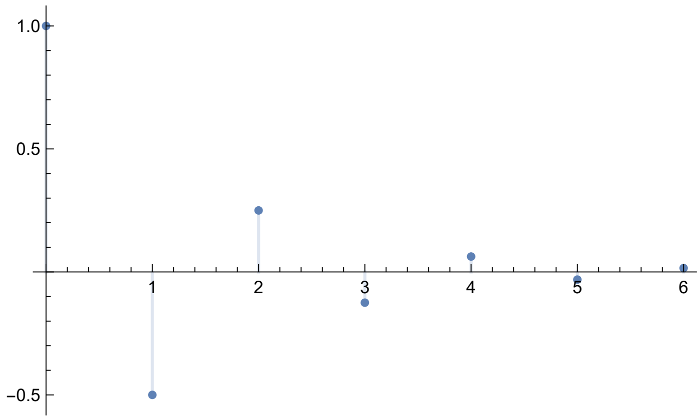
In[∘]:= **λ = Eigenvalues[A]**

Out[∘]=

$$\left\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{5}\right\}$$

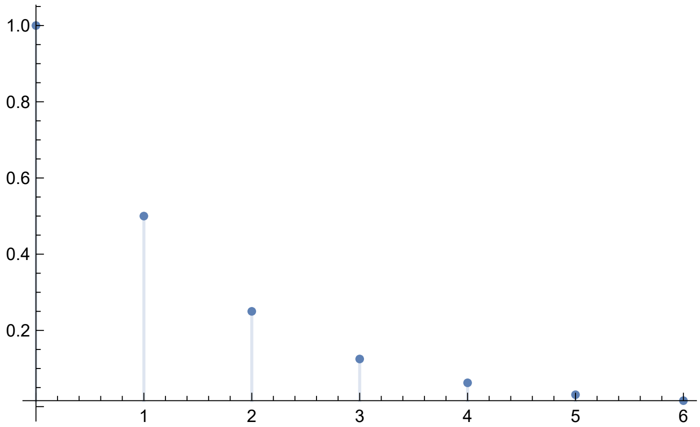
In[∘]:= **DiscretePlot[$\lambda[\![1]\!]^k$, {k, 0, 6}, PlotRange → All]**

Out[∘]=



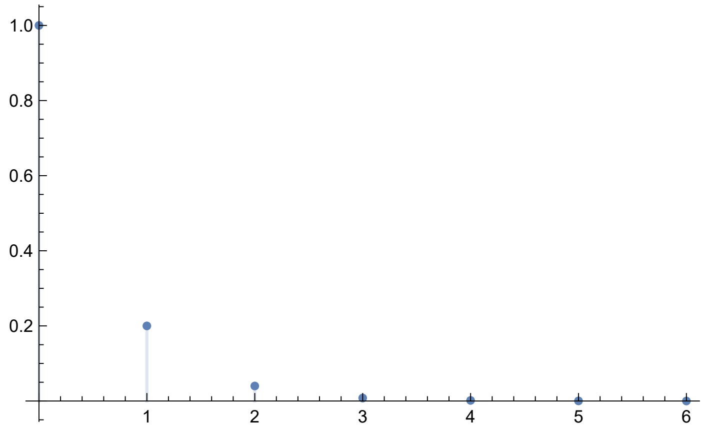
In[∘]:= **DiscretePlot[$\lambda[\![2]\!]^k$, {k, 0, 6}, PlotRange → All]**

Out[∘]=



In[•]:= `DiscretePlot[λ[[3]]^k, {k, 0, 6}, PlotRange → All]`

Out[•]=



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

Out[•]=

$$\left\{\left\{-\frac{1}{2}, -1, -1\right\}, \{1, 2, 1\}, \{1, 1, 1\}\right\}$$

In[•]:= `MatrixForm[T]`

Out[•]//MatrixForm=

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

In[•]:= `λ`

Out[•]=

$$\left\{-\frac{1}{2}, \frac{1}{2}, \frac{1}{5}\right\}$$

In[•]:= `A.T[[All, 1]]`

Out[•]=

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

In[•]:= `A.T[[All, 3]]`

Out[•]=

$$\left\{-\frac{1}{5}, \frac{1}{5}, \frac{1}{5}\right\}$$

In[•]:= x_0 `= {{3}, {-2}, {0}}`

Out[•]=

`{{3}, {-2}, {0}}`

In[•]:= z_0 `= Inverse[T].`x_0

Out[•]=

`{{6}, {-2}, {-4}}`

In[•]:= `{n, n} = Dimensions[A]`

Out[•]=

`{3, 3}`

In[∘]:= $x_1[k\_] := \sum_{i=1}^{n} T[\![All, i]\!]\, \lambda[\![i]\!]^k\, z_0[\![i, 1]\!]$

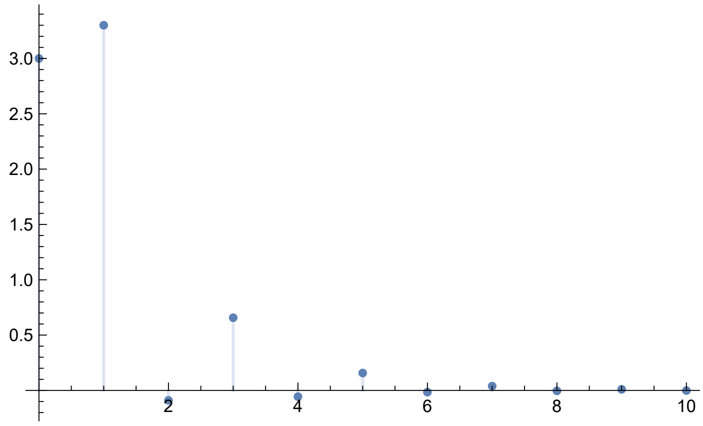
In[∘]:= `MatrixForm[x1[k]]`

Out[∘]//MatrixForm=

$$\begin{pmatrix} -3\left(-\frac{1}{2}\right)^k + 2^{1-k} + 4 \times 5^{-k} \\ 3\,(-1)^k\, 2^{1-k} - 2^{2-k} - 4 \times 5^{-k} \\ -2^{1-k} + 3\,(-1)^k\, 2^{1-k} - 4 \times 5^{-k} \end{pmatrix}$$

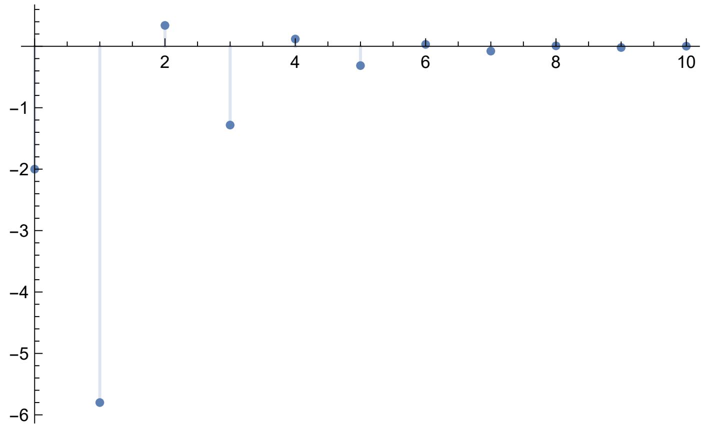
In[∘]:= `DiscretePlot[x1[k][[1]], {k, 0, 10}, PlotRange → All]`

Out[∘]=



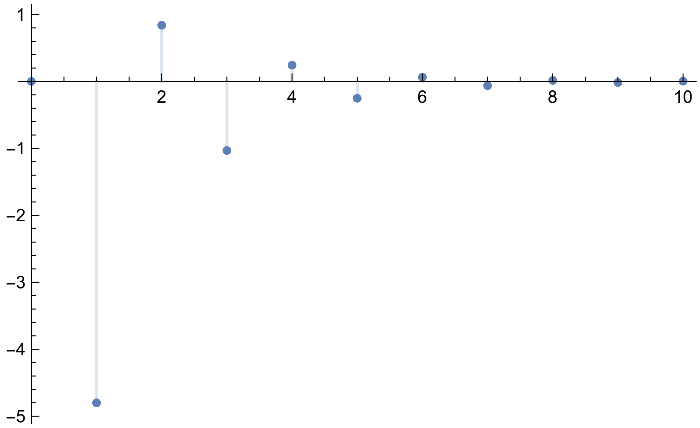
In[∘]:= `DiscretePlot[x1[k][[2]], {k, 0, 10}, PlotRange → All]`

Out[∘]=



In[∘]:= DiscretePlot[x_1[k][[3]], {k, 0, 10}, PlotRange → All]

Out[∘]=



In[∘]:= x_0 = {{2}, {-4}, {-4}}

Out[∘]=

{{2}, {-4}, {-4}}

In[∘]:= z_0 = Inverse[T].x_0

Out[∘]=

{{-4}, {0}, {0}}

In[∘]:= $x_1[k\_] := \sum_{i=1}^{n} T[[All, i]]\, \lambda[[i]]^k\, z_0[[i, 1]]$

In[∘]:= MatrixForm[x_1[k]]

Out[∘]//MatrixForm=

$$\begin{pmatrix} (-1)^k\, 2^{1-k} \\ -(-1)^k\, 2^{2-k} \\ -(-1)^k\, 2^{2-k} \end{pmatrix}$$