

In[63]:= $M = \{\{5, -1, 0, 0, 0\}, \{-1, 5, -1, 0, 0\},$
 $\{0, -1, 5, -1, 0\}, \{0, 0, -1, 5, -1\}, \{0, 0, 0, -1, 5\}\}$

Out[63]= $\{\{5, -1, 0, 0, 0\}, \{-1, 5, -1, 0, 0\}, \{0, -1, 5, -1, 0\}, \{0, 0, -1, 5, -1\}, \{0, 0, 0, -1, 5\}\}$

In[64]:= **Eigenvalues** [M]

Out[64]= $\{5 + \sqrt{3}, 6, 5, 4, 5 - \sqrt{3}\}$

In[65]:=

In[66]:= $MM = \{\{5, -1, 0, 0, 0, 0, 0\}, \{-1, 5, -1, 0, 0, 0, 0\},$
 $\{0, -1, 5, -1, 0, 0, 0\}, \{0, 0, -1, 5, -1, 0, 0\},$
 $\{0, 0, 0, -1, 5, -1, 0\}, \{0, 0, 0, 0, -1, 5, -1\}, \{0, 0, 0, 0, 0, -1, 5\}\}$

Out[66]= $\{\{5, -1, 0, 0, 0, 0, 0\}, \{-1, 5, -1, 0, 0, 0, 0\},$
 $\{0, -1, 5, -1, 0, 0, 0\}, \{0, 0, -1, 5, -1, 0, 0\},$
 $\{0, 0, 0, -1, 5, -1, 0\}, \{0, 0, 0, 0, -1, 5, -1\}, \{0, 0, 0, 0, 0, -1, 5\}\}$

In[67]:= **Eigenvalues** [MM]

Out[67]= $\{5 + \sqrt{2 + \sqrt{2}}, 5 + \sqrt{2}, 5 + \sqrt{2 - \sqrt{2}}, 5, 5 - \sqrt{2 - \sqrt{2}}, 5 - \sqrt{2}, 5 - \sqrt{2 + \sqrt{2}}\}$

In[68]:= **N** [%]

Out[68]= $\{6.84776, 6.41421, 5.76537, 5., 4.23463, 3.58579, 3.15224\}$

In[69]:= **Sort** [%]

Out[69]= $\{3.15224, 3.58579, 4.23463, 5., 5.76537, 6.41421, 6.84776\}$

In[70]:= $MMM = \{\{9, -2, 0, 0, 0, 0, 0, 0, 0, 0\}, \{-2, 9, -2, 0, 0, 0, 0, 0, 0, 0\},$
 $\{0, -2, 9, -2, 0, 0, 0, 0, 0, 0\}, \{0, 0, -2, 9, -2, 0, 0, 0, 0, 0\},$
 $\{0, 0, 0, -2, 9, -2, 0, 0, 0, 0\}, \{0, 0, 0, 0, -2, 9, -2, 0, 0, 0\},$
 $\{0, 0, 0, 0, 0, -2, 9, -2, 0, 0\}, \{0, 0, 0, 0, 0, 0, -2, 9, -2, 0\},$
 $\{0, 0, 0, 0, 0, 0, 0, -2, 9, -2\}, \{0, 0, 0, 0, 0, 0, 0, 0, -2, 9\}\}$

Out[70]= $\{\{9, -2, 0, 0, 0, 0, 0, 0, 0, 0\}, \{-2, 9, -2, 0, 0, 0, 0, 0, 0, 0\},$
 $\{0, -2, 9, -2, 0, 0, 0, 0, 0, 0\}, \{0, 0, -2, 9, -2, 0, 0, 0, 0, 0\},$
 $\{0, 0, 0, -2, 9, -2, 0, 0, 0, 0\}, \{0, 0, 0, 0, -2, 9, -2, 0, 0, 0\},$
 $\{0, 0, 0, 0, 0, -2, 9, -2, 0, 0\}, \{0, 0, 0, 0, 0, 0, -2, 9, -2, 0\},$
 $\{0, 0, 0, 0, 0, 0, 0, -2, 9, -2\}, \{0, 0, 0, 0, 0, 0, 0, 0, -2, 9\}\}$

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In[71]:= Eigenvalues [MMM]
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Out[71]=
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$$\left\{ 9 + \sqrt{81 + \sqrt{-66.3\dots}}, 9 + \sqrt{81 + \sqrt{-69.7\dots}}, 9 + \sqrt{81 + \sqrt{-74.1\dots}}, \right. \\ \left. 9 + \sqrt{81 + \sqrt{-78.2\dots}}, 9 + \sqrt{81 + \sqrt{-80.7\dots}}, 9 - \sqrt{81 + \sqrt{-80.7\dots}}, 9 - \sqrt{81 + \sqrt{-78.2\dots}}, \right. \\ \left. 9 - \sqrt{81 + \sqrt{-74.1\dots}}, 9 - \sqrt{81 + \sqrt{-69.7\dots}}, 9 - \sqrt{81 + \sqrt{-66.3\dots}} \right\}$$

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In[72]:= N[%]
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Out[72]=
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{12.838, 12.365, 11.6194, 10.6617, 9.56926, 8.43074, 7.33834, 6.38056, 5.63499, 5.16203}
```