

$$A = \begin{pmatrix} 4 & 3 & 15 \\ 1 & 1+i & 5 \\ -8 & -2 & 22 \end{pmatrix};$$

n = 3;

showMarkers = False;

showRectangle = Thin;

eval = Eigenvalues[A] // N

vec = Abs[Eigenvectors[A]] // N

{13.4811 - 7.48329 i, 13.3749 + 7.60805 i, 0.14402 + 0.875241 i}

{{1.31711, 0.40112, 1.}, {1.33013, 0.431734, 1.}, {5.83598, 12.4986, 1.}}

circles = Table[

Circle[{Re[A[[i, i]]], Im[A[[i, i]]]},  
Total[Abs[A[[i, Cases[Range[1, n], x\_ /; x ≠ i]]]]],  
{i,  
1,  
n}]

{Circle[{4, 0}, 18], Circle[{1, 1}, 6], Circle[{22, 0}, 10]}

circleCentres = Table[

Callout[  
{Re[A[[i, i]]], Im[A[[i, i]]]},  
Subscript["a", ToString[i] <> ToString[i]]  
,  
{i, 1, n}]

{Callout[{4, 0}, a<sub>11</sub>], Callout[{1, 1}, a<sub>22</sub>], Callout[{22, 0}, a<sub>33</sub>]}

evalPoints = Table[

Callout[  
{Re[eval[[i]]], Im[eval[[i]]]},  
Subscript["λ", i],  
{Re[eval[[i]]] - 0.8, Im[eval[[i]]] + 0.8}  
,  
{i, 1, n}] // N

{Callout[{13.4811, -7.48329}, λ<sub>1</sub>, {12.6811, -6.68329}],

Callout[{13.3749, 7.60805}, λ<sub>2</sub>, {12.5749, 8.40805}],

Callout[{0.14402, 0.875241}, λ<sub>3</sub>, {-0.65598, 1.67524}]}

rangeRe =

Flatten[{Re[Diagonal[A]] + circles[[ ; ; , 2]], Re[Diagonal[A]] - circles[[ ; ; , 2]]}]

{22, 7, 32, -14, -5, 12}

rangeIm =

Flatten[{Im[Diagonal[A]] + circles[[ ; ; , 2]], Im[Diagonal[A]] - circles[[ ; ; , 2]]}]

{18, 7, 10, -18, -5, -10}

{Min[rangeRe], Max[rangeRe]}

{-14, 32}

{Min[rangeIm], Max[rangeIm]}

{-18, 18}

```
Show[
ListPlot[ { circleCentres          showMarkers
  (#1[[1]]) & /@ circleCentres True
,
PlotRange -> {{-20, 40}, {-20, 20}},
PlotStyle -> #,
PlotMarkers -> {"♦", 14},
AxesLabel -> {"Re", "Im"},
ImageSize -> Large,
BaseStyle -> {FontSize -> 14},
AspectRatio -> Automatic
],
ListPlot[ { evalPoints          showMarkers
  (#1[[1]]) & /@ evalPoints True
,
PlotStyle -> #, PlotMarkers -> {"●", 12}],
Legended[
Graphics[
{
# , Thickness[0.004], circles,
Opacity[0.1], Disk @@@ circles
}
]
,
PointLegend[ {#, #}, {"Circle centre", "Eigenvalue"},
LegendMarkerSize -> 14, LegendMarkers -> {{ "♦", 14}, {"●", 11}}
],
Graphics[ {FaceForm[None], EdgeForm[showRectangle],
Rectangle[ {Min[rangeRe], Min[rangeIm]}, {Max[rangeRe], Max[rangeIm]} ] } ]
]
```

