

## NUMERICAL DATA FOR THE E8 MATRIX

The E8 matrix can be characterized as a positive definite matrix with integral entries, even entries along the diagonal, and determinant 1. Specifically, it is given as follows:

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

The purpose of this writeup is to give the principal minors, the characteristic polynomial, and the eigenvectors and eigenvalues accurate to several decimal places.

*Principal minors.* In order of size of the submatrix, these are given as follows:

$$2, 3, 4, 5, 6, 7, 8, 1$$

*Characteristic polynomial.* This is given as follows:

$$t^8 - 16t^7 + 105t^6 - 364t^5 + 714t^4 - 784t^3 + 440t^2 - 96t + 1$$

*Eigenvalues.* In decreasing order here are their approximate values:

$$\begin{aligned} &3.98904381 \\ &3.48628966 \\ &2.81347330 \\ &2.41582339 \\ &1.58417662 \\ &1.18652672 \\ &0.513710349 \\ &0.0109562095 \end{aligned}$$

The approximate coordinates of the associated eigenvectors are listed on the next page.

<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>
3.98904381	3.48628966	2.81347330	2.41582339
<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>
0.119117703	0.383361327	-0.352147093	-0.463505660
-0.23693029	-0.569785962	0.286462251	0.192736490
0.352147092	0.463505658	0.119117705	0.383361322
-0.463505661	-0.1191177045	-0.383621323	-0.352147092
0.569785964	-0.286462255	0.192736491	-0.236930327
-0.383361320	0.352147096	0.463505646	-0.119117703
0.192736492	-0.23693032	-0.569785965	0.286462253
-0.286462252	0.192736489	-0.236930325	0.569785965
<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>	<i>eigenvalue</i>
1.58418	1.18653	0.513711	0.0109562
<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>	<i>eigenvector</i>
-0.463505624	0.352147093	0.383361323	0.119117703
-0.19273646	0.286462251	0.569785964	0.236930326
0.38336131	- 0.119117747	0.463505659	0.352147092
0.352147054	- 0.383361356	0.1191177	0.463505661
-0.236930347	-0.192736464	-0.286462250	0.569785964
0.119117749	0.463505646	-0.35147093	0.383361320
0.286462309	0.569785937	-0.236930327	0.192736491
-0.569785989	-0.236930270	-0.192736490	0.286462252