

(%i1) load("eigen");

(%o1)

/usr/local/share/maxima/5.39.0/share/matrix/eigen.mac

(%i2) load("kenrou.mac");

(%o2)

kenrou.mac

(%i3) A : matrix([1,2,3],[4,5,6],[7,8,9]);

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix} \quad (\text{A})$$

(%i4) cp_kaidan(A);

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 7 & 8 & 9 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & -6 & -12 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & -6 & -12 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & -6 & -12 \end{pmatrix}$$

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

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{pmatrix} \quad (\%o4)$$

(%i5) rank(A);

2

(%o5)

(%i6) B : matrix([1,2,3],[4,5,6],[7,8,0]);

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{pmatrix} \quad (\text{B})$$

(%i7) cp_kaidan(B);

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 7 & 8 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & -6 & -21 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & -6 & -21 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & -6 & -21 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & 0 & -9 \end{pmatrix}$$

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

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

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

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad (\%o7)$$

(%i8) rank(B);

3 (%o8)

(%i9) C : %o4\$

(%i11) kai2hyo(C);

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

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

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

(%o11)

(%i12) cp_hyoujyun(A);

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 7 & 8 & 9 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & -6 & -12 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & -6 & -12 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \\ 0 & -6 & -12 \end{pmatrix}$$

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

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

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

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

(%o12)

(%i13) myinv(B);

$$\begin{pmatrix} 1 & 2 & 3 & 1 & 0 & 0 \\ 4 & 5 & 6 & 0 & 1 & 0 \\ 7 & 8 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & -3 & -6 & -4 & 1 & 0 \\ 7 & 8 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & -3 & -6 & -4 & 1 & 0 \\ 0 & -6 & -21 & -7 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 & 1 & 0 & 0 \\ 0 & 1 & 2 & \frac{4}{3} & -\frac{1}{3} & 0 \\ 0 & -6 & -21 & -7 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 & -\frac{5}{3} & \frac{2}{3} & 0 \\ 0 & 1 & 2 & \frac{4}{3} & -\frac{1}{3} & 0 \\ 0 & -6 & -21 & -7 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 & -\frac{5}{3} & \frac{2}{3} & 0 \\ 0 & 1 & 2 & \frac{4}{3} & -\frac{1}{3} & 0 \\ 0 & 0 & -9 & 1 & -2 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & -1 & -\frac{5}{3} & \frac{2}{3} & 0 \\ 0 & 1 & 2 & \frac{4}{3} & -\frac{1}{3} & 0 \\ 0 & 0 & 1 & -\frac{1}{9} & \frac{2}{9} & -\frac{1}{9} \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & -\frac{16}{9} & \frac{8}{9} & -\frac{1}{9} \\ 0 & 1 & 2 & \frac{4}{3} & -\frac{1}{3} & 0 \\ 0 & 0 & 1 & -\frac{1}{9} & \frac{2}{9} & -\frac{1}{9} \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & -\frac{16}{9} & \frac{8}{9} & -\frac{1}{9} \\ 0 & 1 & 0 & \frac{14}{9} & -\frac{7}{9} & \frac{2}{9} \\ 0 & 0 & 1 & -\frac{1}{9} & \frac{2}{9} & -\frac{1}{9} \end{pmatrix}$$

$$\begin{pmatrix} -\frac{16}{9} & \frac{8}{9} & -\frac{1}{9} \\ \frac{14}{9} & -\frac{7}{9} & \frac{2}{9} \\ -\frac{1}{9} & \frac{2}{9} & -\frac{1}{9} \end{pmatrix}$$

(%o13)

(%i14) gyoursushiki(B);

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 7 & 8 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & -6 & -21 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & -9 \end{pmatrix}$$

27 (%o14)

(%i15) luresolution(A);

$$\left[\begin{pmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ 7 & 2 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & 0 \end{pmatrix} \right] \quad (\%o15)$$

(%i16) f(x) := 4/(1+x^2);

$$f(x) := \frac{4}{1+x^2} \quad (\%o16)$$

(%i17) simpson2(f(x), 0, 1, 1001);

365117641842777127630006535603[3485digits]225866535396240510147870551359
 116220555018668434005352948432[3485digits]905493164558941008827670537500
(%o17)

(%i18) bfloat(%o17);

3.141592653589793b0 (%o18)

(%i19) kill(A,B,C,f);

done (%o19)

(%i20) A : matrix([3,0,1],[0,3,0],[1,0,3]);

$$\begin{pmatrix} 3 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 3 \end{pmatrix} \quad (\text{A})$$

(%i22) P : diagonalizer(A);

$$\begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{\sqrt{2}} & 0 & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & 0 & \frac{1}{\sqrt{2}} \end{pmatrix} \quad (\text{P})$$

(%i23) Q : transpose(P);

$$\begin{pmatrix} 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ 1 & 0 & 0 \\ 0 & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{pmatrix} \quad (\text{Q})$$

(%i24) P . A . Q;

$$\begin{pmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{pmatrix} \quad (\%o24)$$

(%i25) diagonalize(A);

$$\begin{pmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{pmatrix} \quad (\%o25)$$

(%i26) B : matrix([1,2,3],[4,5,6],[7,8,0]);

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{pmatrix} \quad (\text{B})$$

(%i28) C : unitarize(B);

$$\begin{pmatrix} \frac{1}{\sqrt{66}} & \frac{3}{\sqrt{11}} & -\frac{1}{\sqrt{2}\sqrt{3}} \\ \frac{4}{\sqrt{66}} & \frac{1}{\sqrt{11}} & \frac{\sqrt{2}}{\sqrt{3}} \\ \frac{7}{\sqrt{66}} & -\frac{1}{\sqrt{11}} & -\frac{1}{\sqrt{2}\sqrt{3}} \end{pmatrix} \quad (\text{C})$$

(%i29) D : transpose(C);

$$\begin{pmatrix} \frac{1}{\sqrt{66}} & \frac{4}{\sqrt{66}} & \frac{7}{\sqrt{66}} \\ \frac{3}{\sqrt{11}} & \frac{1}{\sqrt{11}} & -\frac{1}{\sqrt{11}} \\ -\frac{1}{\sqrt{2}\sqrt{3}} & \frac{\sqrt{2}}{\sqrt{3}} & -\frac{1}{\sqrt{2}\sqrt{3}} \end{pmatrix} \quad (\text{D})$$

(%i30) ratsimp(C . D);

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad (\%o30)$$

(%i31) ratsimp(D . C);

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \quad (\%o31)$$