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> restart:
with(linalg):

A:=matrix(3,2,[36,-27, 0,0, -48,36]);
B:=evalm(transpose(A)*A);
charpoly(B,lambda);
eigenvectors(B);

E:=matrix(2,2,[
(-4/3)/sqrt((4/3)^2+1), 1/sqrt((4/3)^2+1),
1/sqrt((4/3)^2+1), (4/3)/sqrt((4/3)^2+1)]);

Lambda:=matrix(3,2,[sqrt(5625),0, 0,0, 0,0]);

F0:=evalm(A*E);

F1:=evalm((1/75)*F0);

F:=matrix(3,3,[-3/5,4/5,0, 0,1,0, 4/5,1,3/5]);
print(evalm(A),"=",evalm(F),"*",evalm(Lambda),"*",evalm(transpose(E)));

evalm(A-F*Lambda*transpose(E));

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$$A := \begin{bmatrix} 36 & -27 \\ 0 & 0 \\ -48 & 36 \end{bmatrix}$$

$$B := \begin{bmatrix} 3600 & -2700 \\ -2700 & 2025 \end{bmatrix}$$

$$\lambda^2 - 5625 \lambda$$

$$\left[5625, 1, \left\{ \left[\frac{-4}{3}, 1 \right] \right\} \right], \left[0, 1, \left\{ \left[1, \frac{4}{3} \right] \right\} \right]$$

$$E := \begin{bmatrix} \frac{-4}{5} & \frac{3}{5} \\ \frac{3}{5} & \frac{4}{5} \end{bmatrix}$$

$$\Lambda := \begin{bmatrix} 75 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

$$F0 := \begin{bmatrix} -45 & 0 \\ 0 & 0 \\ 60 & 0 \end{bmatrix}$$

$$F1 := \begin{bmatrix} -\frac{3}{5} & 0 \\ 0 & 0 \\ \frac{4}{5} & 0 \end{bmatrix}$$

$$F := \begin{bmatrix} -\frac{3}{5} & \frac{4}{5} & 0 \\ 0 & 1 & 0 \\ \frac{4}{5} & 1 & \frac{3}{5} \end{bmatrix}$$

$$\begin{bmatrix} 36 & -27 \\ 0 & 0 \\ -48 & 36 \end{bmatrix}, "=", \begin{bmatrix} -\frac{3}{5} & \frac{4}{5} & 0 \\ 0 & 1 & 0 \\ \frac{4}{5} & 1 & \frac{3}{5} \end{bmatrix}, "*", \begin{bmatrix} 75 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}, "*", \begin{bmatrix} -\frac{4}{5} & \frac{3}{5} \\ \frac{3}{5} & \frac{4}{5} \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix}$$

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