Given

\[ A = \begin{bmatrix} 4 & 2 & 6 \\ 2 & 4 & 6 \end{bmatrix} \]

(4 pts) Find the rank and a basis for the row space.

(4 pts) Find the rank and a basis for the column space.
(8 pts) Solve by Cramer’s rule.

\[
\begin{align*}
2x & -3z &= 28 \\
4x & -5y + 2z &= 13 \\
y & -5z &= 29
\end{align*}
\]
Given

\[ A = \begin{bmatrix} -5 & 0 & 15 \\ 3 & 4 & -9 \\ -5 & 0 & 15 \end{bmatrix}, \quad P = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \]

(4 pts) Find \( \hat{A} = P^{-1}AP \)

(4 pts) Verify that \( A \) and \( \hat{A} \) have the same spectra.
(4 pts) Find eigenvectors $\vec{y}$ of $\hat{A}$.

(2 pts) Show that $\vec{x} = P\vec{y}$ are eigenvectors of $A$. 
(4 pts) What kind of conic section (or pair of straight lines) is given by the quadratic form? Transform it to principal axis.

\[13x_1^2 + 10x_1x_2 + 13x_2^2 = 72\]

(4 pts) Express the initial vector \(x^T = [x_1, x_2]\) in terms of the new coordinate vector \(y^T = [y_1, y_2]\).

(2 pts) Find the angle of the rotation. Draw the picture.