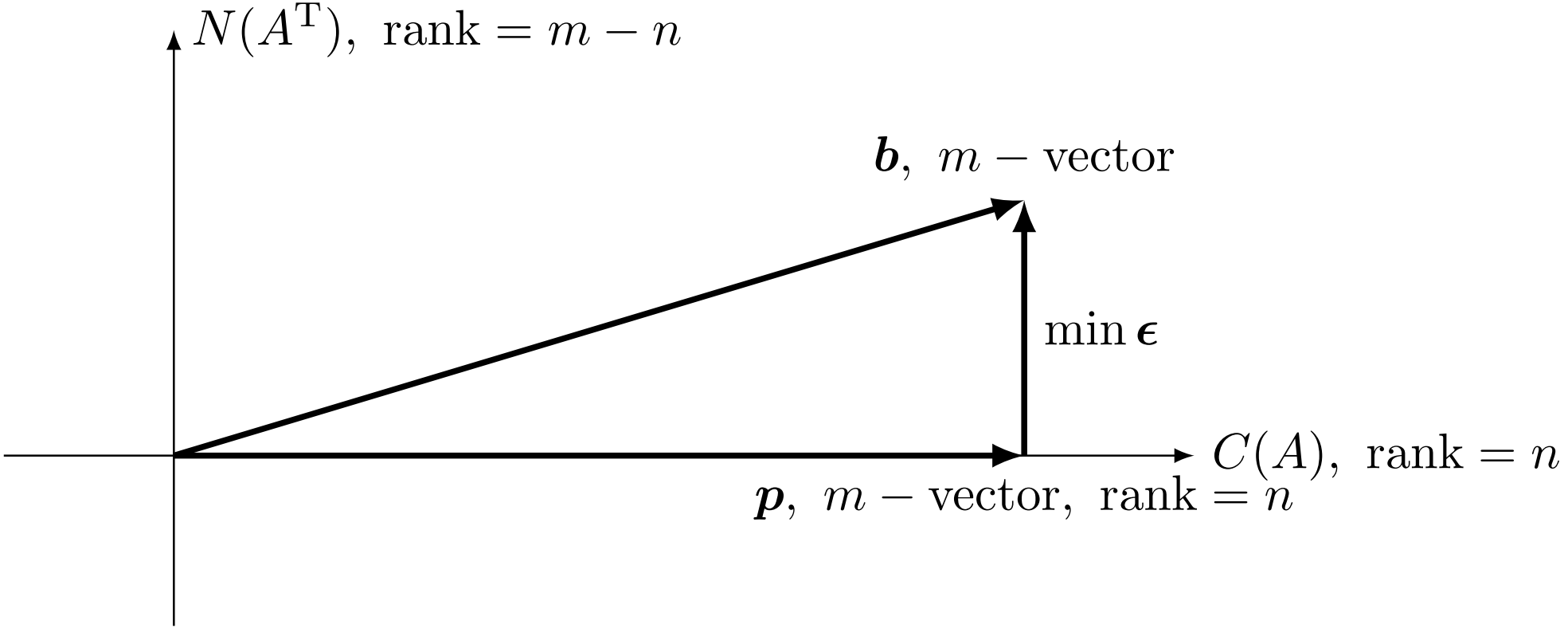

$$
\begin{cases}
A = \begin{bmatrix} Q_1 & Q_2 \end{bmatrix} \begin{bmatrix} R_1 \\ 0 \end{bmatrix} \\
\boldsymbol{p} = A\hat{\boldsymbol{x}} = Q_1 Q_1^{\mathrm{T}} \boldsymbol{b} \qquad \operatorname{rank}\left(Q_1 Q_1^{\mathrm{T}}\right) = n \\
\boldsymbol{\epsilon} = A\hat{\boldsymbol{x}} - \boldsymbol{b} = -Q_2 Q_2^{\mathrm{T}} \boldsymbol{b} \qquad \operatorname{rank}\left(Q_2 Q_2^{\mathrm{T}}\right) = m - n \\
Q_1 Q_1^{\mathrm{T}} \text{ gives projection onto } C(A) \\
Q_2 Q_2^{\mathrm{T}} \text{ gives projection onto } N(A^{\mathrm{T}})
\end{cases}
$$