

(Q1) For the equation $Ax = b$.

$A \in \mathbb{R}^{m \times n}$ is an invertible matrix
 $b \in \mathbb{R}^n$ is a given vector.

$$A \hat{x} = b + \delta b$$

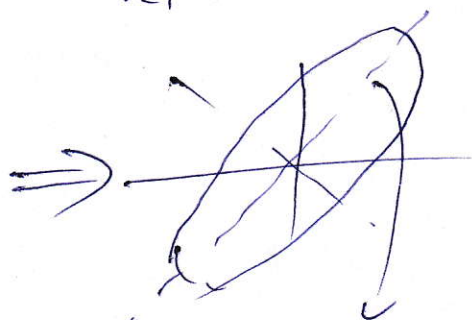
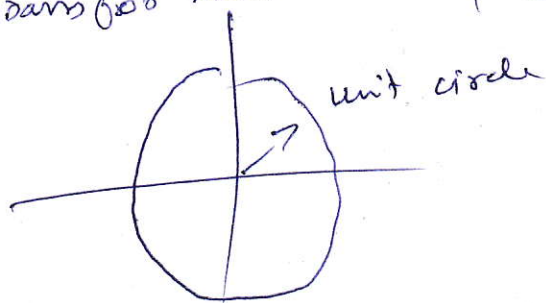
Consider $\hat{x} = x + \delta x$

$$A(x + \delta x) = b + \delta b$$

$$A \cdot \delta x = \delta b.$$

$$\boxed{\delta x = A^{-1} \delta b}$$

Visualising as a circle to ellipse
transformation. $\begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ $x_1^2 + x_2^2 = 1$



(corresponds to max elongation)

Perturbation in δb should be in the direction of vector corresponding to maximum elongation.
to (can be derived from A).