

Indian Institute of Information Technology Allahabad
C2 Assignment (Linear Algebra)

Program: B.Tech. 1st Semester
 Deadline for Submission: January 31, 2023

Full Marks: 10

Note: Let us define sets A and B as follows:

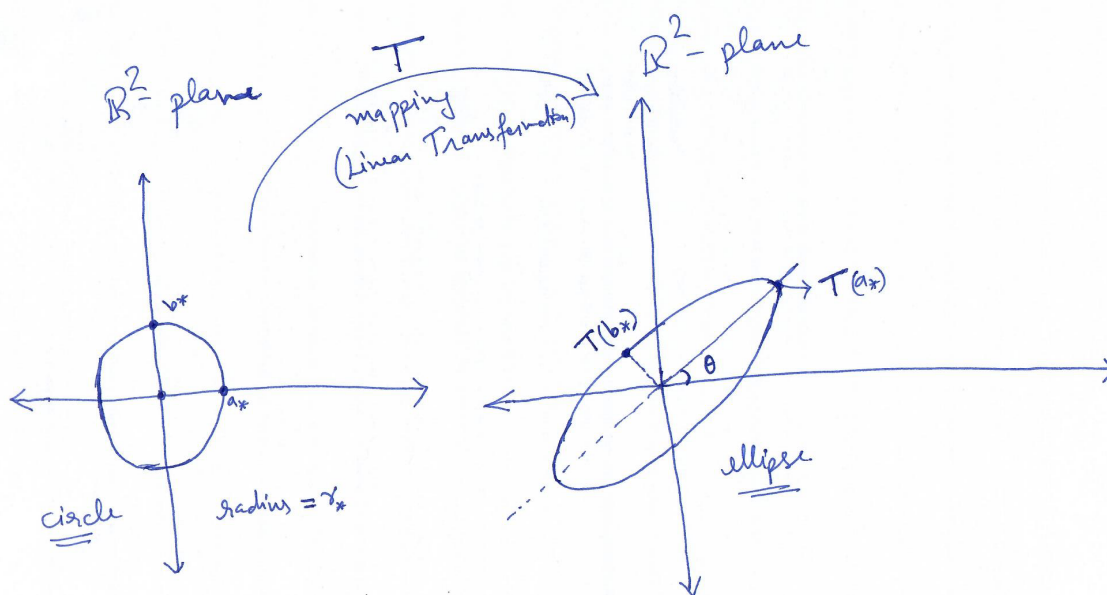
$$A = \{\text{Your first name}\} \quad \text{and} \quad B = \{\text{Your last name}\}$$

In the absence of a last name, take $B = \{l, a, s, t, n, m, e\}$

For example: if your name is **Peter Massopust**, then $A = \{p, e, t, r\}$ and $B = \{m, a, s, o, p, u, t\}$.

We denote the number of elements in a set X by $|X|$. Now, define $C = A \cup B$, $D = A \times B$,
 $n =$ the sum of last four digits of your enrolment number, and **Num** = $|C| + |D| + n$.

- Construct a linear transformation $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ such that the image of the circle under T is the ellipse as shown in the following figure: [4]



where $\theta = \mathbf{Num}$, the radius of the circle $r_* = |C| + 1$, the distances of $T(a_*)$ and $T(b_*)$ from the origin are $|D|$ and $|C|$, respectively.

- Find eigenvalues and eigenvectors (if exist) of the linear transformation $S := T^k = T \circ T \circ \dots \circ T$ (k -times autocomposition of T), where $k = |A|$. [1+2+3=6]