1. Let \( c: I \to \mathbb{R}^2 \) be a regular plane curve. Determine how the curvature of \( c \) changes if one applies the following transformations of \( \mathbb{R}^2 \) to its image:

(a) a translation \((x_1, x_2) \mapsto (x_1 + C_1, x_2 + C_2)\);
(b) a rotation \( R_\alpha = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix} \);
(c) a reflection \((x_1, x_2) \mapsto (-x_1, x_2)\);
(d) a dilation \((x_1, x_2) \mapsto (rx_1, rx_2)\).

2. Compute the curvature of the ellipse \( \{ (x_1, x_2) \mid \frac{x_1^2}{a^2} + \frac{x_2^2}{b^2} = 1 \} \) where \( 0 < a < b \). At what point(s) does the curvature take on its maximum and minimum values?

3. (Bonus) Let \( c: I \to \mathbb{R}^2 \) be a regular plane curve such that \( \|c(t)\| \leq 1 \) for all \( t \in I \). Suppose there is a point \( t_0 \in I \) such that \( \|c(t_0)\| = 1 \). Prove that the curvature at that point satisfies \( |\kappa(t_0)| \geq 1 \).