Q2a: We take note that L_1 has 2 eigenvalues, -1 corresponding to $(1,0)$ and 1 corresponding to $(0,1)$. The determinant is the product of the eigenvalues, so $det(L_1) = -1 < 0$. Therefore, this reverses the standard orientation of $\mathbb{R}^2$.

Q2b: The matrix representing L_2 looks like $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ We have that $\det(A) = -1$. Therefore this linear map is orientation reversing.

Q2c: Let A be the matrix representing the linear transformation L_3, then $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ for $\theta = \frac{2\pi}{7}$. This will have a determinant 1, thus L_3 is orientation preserving.

Q2d: The matrix A representing L_4 will be represented by the same matrix as in 2c, except $\theta = \frac{12\pi}{7}$. The determinant of A will be 1 as well, thus L_4 is orientation preserving.

Q2e: The matrix A representing L_5 takes the form $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ The determinant of A is -1, so L_5 is orientation reversing.

Q2f: L_6 is represented by the matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ We see that $\det(A) = 1$. Therefore, L_6 is orientation preserving

Q2g: L_7 will have n identical eigenvalues, -1, corresponding to each basis vector. Therefore the $\det(L_7) = (-1)^n$. L_7 is orientation preserving if n is even, and orientation reversing if n is odd.

Q2h: Note that L_8 can be written as the composition of $n \cdot m$ transpositions, each of which swaps one basis entry with another. Each transposition has a determinant of -1, so their composition has a determinant of $(-1)^{n \cdot m}$. Therefore, L preserves orientation if $n \cdot m$ is even, and reverses orientation if $n \cdot m$ is odd.