Question 1. (1.5 points) What is the matrix representing a translation by vector \([1, 3, -1]\)? What is the matrix representing a 60 degree rotation around the \(X\) axis? If we apply the rotation to a vector \([0, 1, -1]\) first, and then apply the translation, what is the result? (Use homogeneous matrix-vector products to show your answer.)

Question 2. (1 point) Is \(M = \begin{bmatrix} -0.36 & 0.48 & -0.8 \\ 0.48 & -0.64 & -0.6 \\ 0.8 & 0.6 & 0 \end{bmatrix}\) a rotation matrix? Why? (A proper rotation matrix must satisfy two properties.)
Question 3.  (1.5 points) Let $p(t)$ (for $t \in [0, 1]$) be a cubic Bezier curve defined by four points $p_0 = [0, 0, 0]$, $p_1 = [8, 4, 0]$, $p_2 = [0, 4, 0]$, and $p_3 = [4, 4, 0]$, in which $p_1$ and $p_2$ are two additional control points. Where is the point $p(0.75)$ of this curve?

Question 4.  (1 point) What is the quaternion representing a 90 degree rotation around $[2, 1, -4]$?

Submission Guideline  Please submit your solution either in person or by email to our grader. If you finish it early, you may also give it to the professor after class.