Practice Problems - 04

Practice problems are supposed to help you digest the content of the lecture. It is important that you manage to solve them on your own. Before you write your solutions, you may of course ask questions, and discuss things. In order to prepare for the exam, already now, try to explicitly write down your solutions – clearly and easy to read. Apply definitions properly, and give explanations for what you are doing. That will help you to understand them later when you prepare for the final exam.

I. Quaternions

1) Construct a quaternion to rotate 60deg about the y-axis. Calculate the conjugate of the quaternion. Calculate the rotation of the point $P = (1, 1, 1)^T$.

2) Construct a quaternion to rotate 30deg about the y-axis. Calculate the conjugate of the quaternion. Calculate the rotation of the point $P = (1, 1, 1)^T$.

3) Construct a quaternion to rotate 90deg about the z-axis. Calculate the rotation of the point $P = (1, 0, 1)^T$.

4) Construct a quaternion to rotate 90deg about the x-axis. Calculate the rotation of the point $P = (0, 1, 1)^T$.

5) Calculate the angle of rotation and the normalized axis vector for the following quaternion: $\left[0.5 \left(0, 0, \frac{1}{2}\sqrt{3}\right)\right]$.

6) Multiply the two following quaternions: $q_1 = 4 + 3i + 2j - k$ and $q_2 = i - k$.

7) Multiply the two following quaternions: $q_1 = 4 + 4i + 4j + k$ and $q_2 = j - k$