# 3. Written Questions

## 3.1 Analytic IK: RPR Robot

3.1.1.)



Law of cosines:

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3.1.2.)

Assuming, as stated, that has no upper bound, then every position is inherently accessible; since, the effector could be placed at any distance from the origin by just configuring and and could be set as if the robot where using polar coordinates. Additionally, the equations derived in 3.1.1 impose no limits on accessible values of for a given position ).

## 3.2 Numerical IK: Cost Function

3.2.1.)

3.2.2.)

3.2.3.)

3.2.4.)

It looks the same. The gradient found in 3.2.3. looks the same regardless of the number of links in a serial chain of revolute joints since it is in vectorized form in terms of the Jacobian.