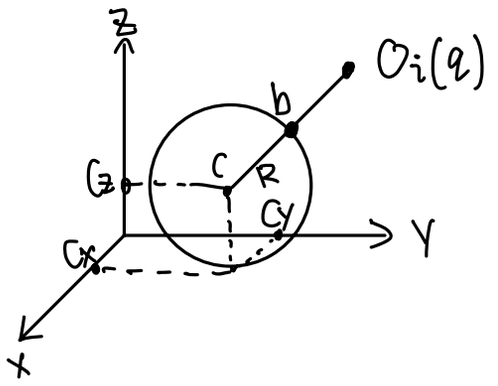
Case 1: A sphere of radius R centred at $C = (C_x, C_y, C_z)$

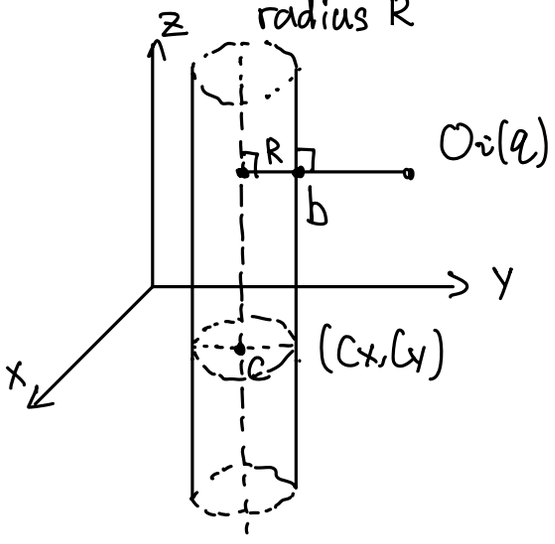


$$\|O_i(q) - b\| = \|O_i(q) - C\| - R$$

$$O_i(q) - b = \frac{O_i(q) - C}{\|O_i(q) - C\|} \cdot \|O_i(q) - b\|$$

$$O_i(q) - b = \frac{O_i(q) - C}{\|O_i(q) - C\|} \cdot \left(\|O_i(q) - C\| - R\right)$$

Case2: A cylinder of infinite height centred at $C = (C_x, C_y)$, parallel to z_o, radius R



let $O_i(q) = (O_x, O_y, O_z)$

$$\|O_i(q) - b\| = \sqrt{(O_x - C_x)^2 + (O_y - C_y)^2} - R$$

$$O_i(q) - b = \frac{O_i(q) - [C_x \; C_y \; O_z]^T}{\left\|O_i(q) - [C_x \; C_y \; O_z]^T\right\|} \cdot \left(\sqrt{(O_x - C_x)^2 + (O_y - C_y)^2} - R\right)$$