$$R_g^2 = \left\langle \frac{1}{N} \sum_{i=1}^{N} (\mathbf{r}_i - \mathbf{r}_{CM})^2 \right\rangle \tag{1}$$

$$Q_{xy} = \frac{1}{N} \sum_{i=1}^{N} \mathbf{r}_x^i \mathbf{r}_y^i \tag{2}$$

$$Q = \begin{bmatrix} Q_{xx} & Q_{xy} & Q_{xz} \\ Q_{yx} & Q_{yy} & Q_{yz} \\ Q_{zx} & Q_{zy} & Q_{zz} \end{bmatrix} = \begin{bmatrix} \lambda_x^2 & 0 & 0 \\ 0 & \lambda_y^2 & 0 \\ 0 & 0 & \lambda_z^2 \end{bmatrix} \tag{3}$$

$$\lambda_x^2 \leq \lambda_y^2 \leq \lambda_z^2 \tag{4}$$

$$b = \lambda_z^2 - \frac{1}{2}(\lambda_x^2 + \lambda_y^2) \tag{5}$$

$$c = \lambda_y^2 - \lambda_x^2 \tag{6}$$

$$\kappa = \frac{3}{2} \frac{Tr\hat{Q}^2}{(TrQ)^2} \tag{7}$$

$$\hat{Q}_{ij} = Q_{ij} - \delta_{ij} TrQ/3 \tag{8}$$

$$\kappa^2 = \frac{3}{2} \frac{\lambda_x^4 + \lambda_y^4 + \lambda_z^4}{(\lambda_x^2 + \lambda_y^2 + \lambda_z^2)^2} - \frac{1}{2} \tag{9}$$

$$0 \leq \kappa \leq 1 \tag{10}$$