Exercise Round 5

The deadline of this exercise round is **Thursday February 13th, 2025**. The solutions will be discussed during the exercise session in the T2 lecture hall of Computer Science building starting at 14:15.

The problems should be *solved before the exercise session*. During the session those who have completed the exercises will be asked to present their solutions on the board/screen.

Exercise 1. (Sigma-point Methods and Linear Functions)

Show that when the function is linear, the spherical cubature rule gives the exact result.

Exercise 2. (Hermite polynomials)

Show that one-dimensional Hermite polynomials $H_0(0) = 1$, $H_1(x) = x$, and $H_2(x) = x^2 - 1$ are orthogonal with respect to the inner product

$$\langle f, g \rangle = \int f(x)\, g(x)\ \mathrm{N}(x \mid 0, 1)\ \mathrm{d}x.$$

Exercise 3. (Bearings Only Target Tracking with CKF and UKF)

Implement CKF and UKF to the bearings only target tracking model in Exercise 3 of Round 4. Plot the results and compare RMSE values of the different methods.