Numerical Methods (CS 357)

Worksheet

Part 1. Orthogonal vectors

Suppose you know that two orthogonal vectors x and y have $\|x\|_2 = 3$ and $\|y\|_2 = 4$. What is $\|x + y\|_2$?

Part 2. Point-normal form

Consider the line in point-normal form

$$\frac{1}{\sqrt{2}} \begin{bmatrix} -1 \\ 1 \end{bmatrix} \cdot \vec{x} = 3$$

What is the distance of the point $[3, 0]^T$ to the line?
Hint: $1/\sqrt{2} \approx 0.70711$.

Part 3. Orthogonalizing three vectors

You are given three vectors `x`, `y`, and `z`. Produce `xo`, `yo`, `zo` so that:

- all vectors are orthogonal to each other.
- `xo`, `yo`, and `zo` span the same space as `x`, `y`, and `z`.

```
import numpy as np

xo =
yo =
zo =
```