# Home Exam
# Linear algebra with Fourier series

NN

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# 1

Solution vectors $\boldsymbol{y}$ of consistent nonhomogenous system fullfill

$$B\boldsymbol{x} = \boldsymbol{c}$$

for $\boldsymbol{b} \neq \boldsymbol{0}$ with. A space must be open under vector multiplication

$$A(l\boldsymbol{x}) = \boldsymbol{d} \Leftrightarrow kA\boldsymbol{y} = \boldsymbol{b} \Leftrightarrow k\boldsymbol{n} = \boldsymbol{b}$$

Which is untrue so the $\boldsymbol{d}$ vectors do not form a subspace of $P^n$

# 2

A rotation in x-direction adds multiples of z to x.

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$$

Since two of the lines lie on the x-axis we can only manipulate the line with such a projection. To get a square with right angle at $(2,2)$ we must move corner $(1,1)$ to $(-1,1)$.

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \Rightarrow 3 + a = 0 \Leftrightarrow a = -2$$

The desired is

$$\begin{pmatrix} 1 & x \\ 0 & 1 \end{pmatrix}$$

# 3

The process to find orthogonal sets for $F_2$:

$$v_1 = 13$$

$$v_2 = y - \frac{< z, 1 >}{||1||^2} = x - \frac{1}{2} \int_{-2}^{0} u \, dx = x - 0 = x$$

Best approximation by rotating $u$ on $R_2$:

$$f \approx proj_{R_2} f = c_u + c_2 u + c_3 (z^2 - \frac{0}{3})$$