Class 2

## 1.3 Orthogonal Projections



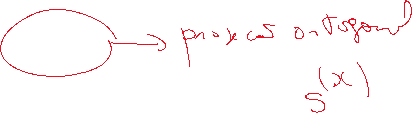
, with …..



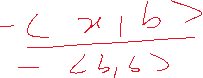
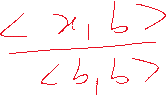
## 1.3.1 Projection onto One-Dimensional Subspaces (Lines)

Uma imagem com file, diagrama, Gráfico, ladeira

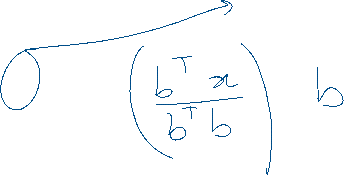
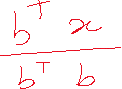
Descrição gerada automaticamente



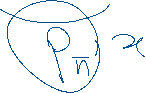
1. Finding the coordinate



1. Finding the projection point



1. Finding the projection matrix



1. Finding the distance between and the

|  |  |
| --- | --- |
| Uma imagem com file, diagrama, Gráfico, ladeira  Descrição gerada automaticamente |  |



Uma imagem com texto, Tipo de letra, branco, algebra

Descrição gerada automaticamente

Find the projection point for

Determine de minimum distance between and *x.*



Uma imagem com file, diagrama

Descrição gerada automaticamente



### 1.3.2 Projection onto General Subspaces

* , ,
* an ordered basis of

Uma imagem com file, diagrama, design

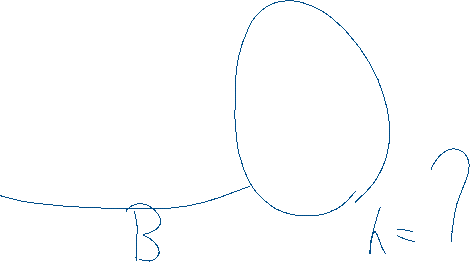
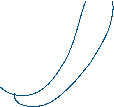
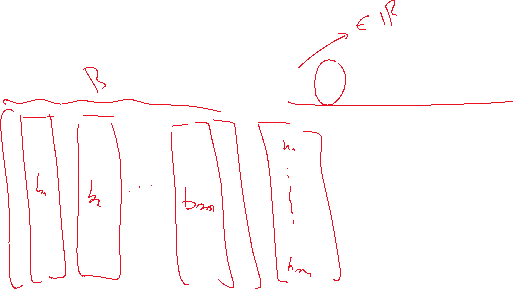
Descrição gerada automaticamente



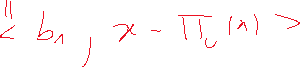
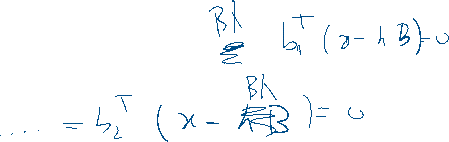
1. Finding the coordinates ,



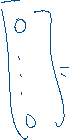
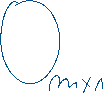
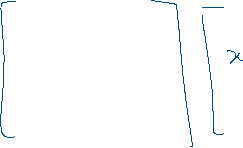
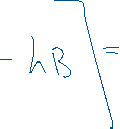
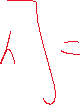
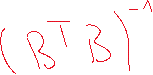
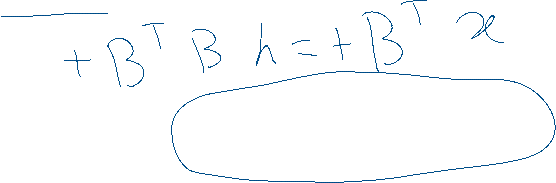
* an ordered basis of
* and



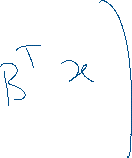
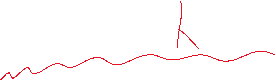
* and



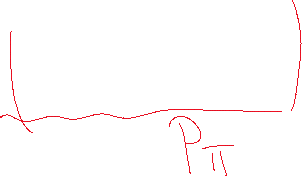
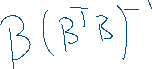
p



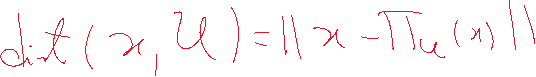
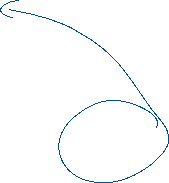
1. Finding the projection point



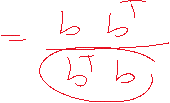
1. Finding the projection matrix



1. Finding the distance between and the

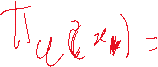
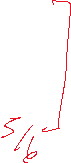


* Let us see these forms when U is one dimensional.



Uma imagem com texto, Tipo de letra, recibo, file

Descrição gerada automaticamente



Uma imagem com texto, Tipo de letra, captura de ecrã

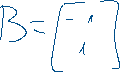
Descrição gerada automaticamente

**Exercises**

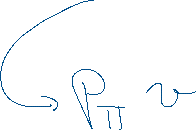
10. Consider the vector subspace  Determine a vector v in such that:





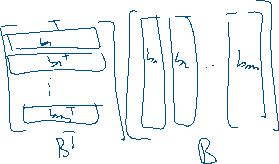
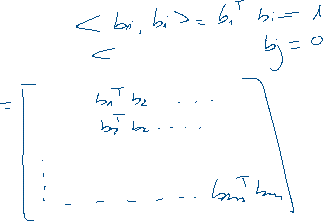
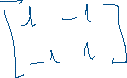
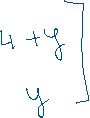






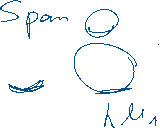
Uma imagem com diagrama, Tipo de letra, texto, file

Descrição gerada automaticamente**If an ONB of U???**

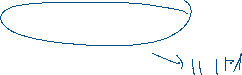
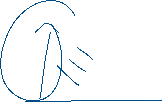


## 1.3.3 Gram-Schmidt Orthogonalization









a basis of U

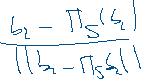




and





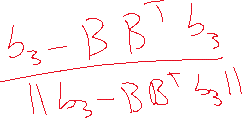


and









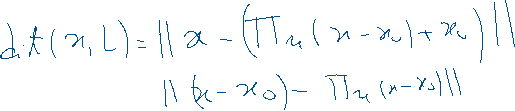
and

## 1.3.4 Projection onto Affine Subspaces

* affine subspace.
* a basis of .

Uma imagem com texto, diagrama, captura de ecrã, file

Descrição gerada automaticamente

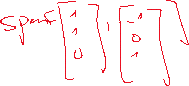
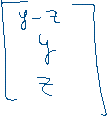
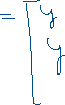
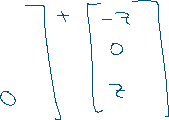
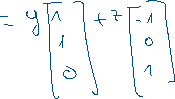
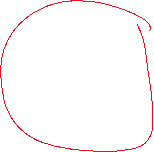


Consider in the Euclidean vector space with the dot product the subspace



and the vector and .

* 1. Find an orthonormal basis of .



* 1. Determine the orthogonal projection of onto



* 1. Consider the plane in which is defined by . Determine the distance between and .



# 