Inside Class 6 Problem 1 Are the following sets convex, affine, subspaces? 1) 5 = [x | x = Ay + C', for some y \in IRK

mx k and C' constant } 2) The set  $\{x \mid x + 5g \leq 5j\}$ where 5i,  $5g \in R$  with 5j convex

Problem 2

)Given P= [xe IR2 | x1>0, 2x1+ x2 < 3]

x2>0, x1+ 2x2 < 3]

Is the point (1) a vertex?

2)  $P = \{ \{ x \mid x \geq 0, \ C \mid x = d \} \}$   $x \in \mathbb{R}^m$ 

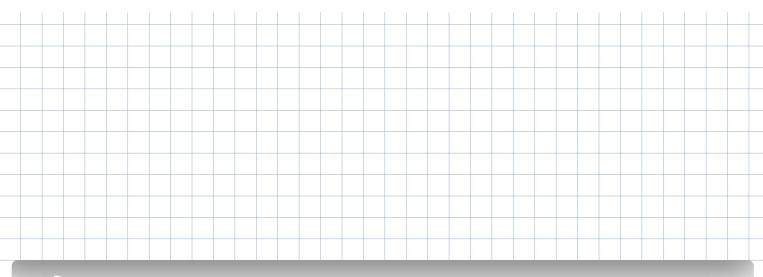
Prove that the vertices of P Cif they exist ) have at least n-m zero elements

3) How many vertices con the polyhedron  $P = [ x | A \times 5b]$  have?

4) How many vertices does the polyhedron

5= \( \times \) \( 0 \le \times \le 1 \) have?

Prove that, for  $x \in \mathbb{R}^n$ , if the function f(x) is a convex function, then the set  $C = \{x | f(x) \leq b\}$  is a convex set, with  $b \in \mathbb{R}$  a given constant.



Can you find the solution to the following problem (call this P1), by solving an LP?

$$\begin{array}{ll}
\text{minimize}_x & ||x||_1^2 + 2||x||_1\\ 
\text{subject to} & Ax = b,
\end{array} \tag{1}$$

where  $x \in \mathbb{R}^n$ , A is an  $m \times n$  matrix and  $b \in \mathbb{R}^m$ . If yes, explain which LP you can solve, if not, explain why.