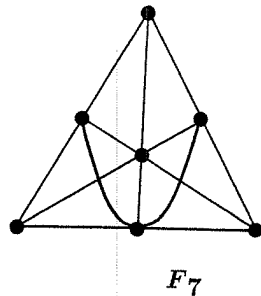


## INTRODUCTION TO MATROID THEORY SUGGESTED EXERCISES

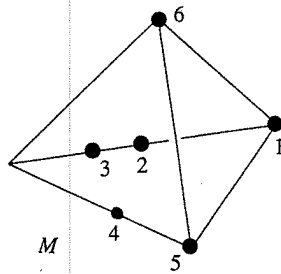
This exercise sheet is meant to give some familiarity in the use of diagrammatic representations of matroids. Because of this, some of the items are not really "exercises to be solved" but "checks to perform in order to verify your understanding". Please do not hesitate to contact me (e.g. by e-mail) for any questions.

1. The following diagram represents the so-called "Fano matroid".



Prove that  $F_7$  is not graphic.

2. Let  $M$  be the matroid represented by the following diagram

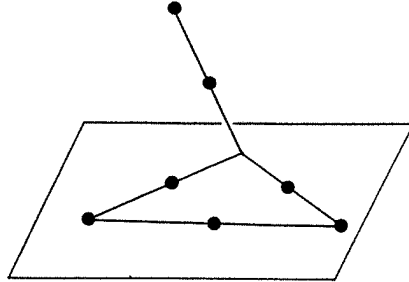


Draw a diagram for the dual of  $M$ .

(Notice: (a) the points in every "triangle" are in a plane; (b) The dual of  $M$  might (!) have loops and parallel elements).

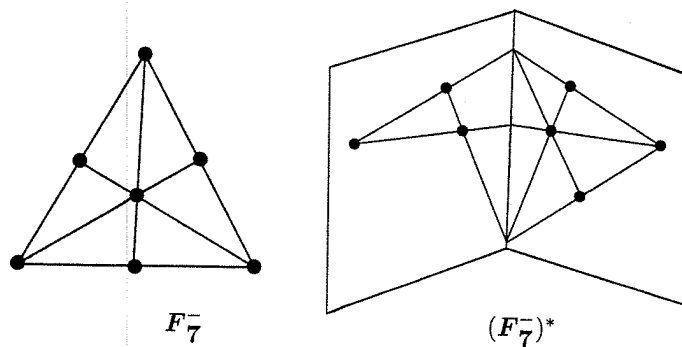
**Please turn the page.**

3. Let  $M$  be the matroid represented by the following diagram



Draw a diagram representing the dual  $M^*$ . (Hint: remember that any two – “drawn” – intersecting lines lie in a common plane, even if they do not intersect in a point of the matroid.)

4. The two diagrams below represent a pair of dual matroids. Label the points so as to exhibit this duality (e.g., so that a basis on the left is a cobasis on the right, etc.).



(The matroid  $F_7^-$  is called the “Non-Fano” matroid)

5. Draw a diagram for the dual of the Fano matroid  $F_7$ .