

# Linear Algebra

## Math 220

### Exercises due Tuesday, February 5

The exercises below pertain to the function:

$$f(x_1, x_2, x_3) = M \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

where

$$M = \begin{pmatrix} 1 & -2 & -1 \\ 5 & 4 & -3 \\ -2 & -3 & 1 \end{pmatrix} .$$

1. Put the matrix  $M$  in reduced row echelon form.
2. Use your result in the preceding exercise as an aid to finding the set of all points  $(x_1, x_2, x_3)$  for which  $f(x_1, x_2, x_3) = (0, 0, 0)$ .
3. What word describes the type of geometric object in 3-dimensional space that is represented by your last answer?
4. Can you characterize the set of all points  $(y_1, y_2, y_3)$  that occur as  $f(x_1, x_2, x_3)$  for one or more points  $(x_1, x_2, x_3)$ ?