

# Worksheet 7

Sections 306 and 310  
MATH 54

September 13, 2018

**Exercise 1.** Let  $T$  be a linear transformation defined by  $T(\mathbf{x}) = A\mathbf{x}$ , where

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 5 & 10 & 3 \end{bmatrix}.$$

Is  $T$  one-to-one? onto? Discuss what this means in your own words with your group.

**Exercise 2.** State the row operation shown below and describe how it affects the determinant.

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \rightarrow \begin{bmatrix} a + kc & b + kd \\ c & d \end{bmatrix}$$

Actually compute the determinants, don't use Theorem 3.

**Exercise 3.** Find the determinant by row reduction to echelon form. (It is ok (and encouraged!) to use Theorem 3 for this exercise.)

$$\begin{vmatrix} 3 & 3 & -3 \\ 3 & 4 & -4 \\ 2 & -3 & -5 \end{vmatrix}$$

**Exercise 4.** Suppose that we already know that:

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 7.$$

Compute the following determinant:

$$\begin{vmatrix} -5d + g & -5e + h & -5f + i \\ a & b & c \\ g & h & i \end{vmatrix}$$

**Exercise 5.** Let  $A = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ . Write  $5A$ . Is  $\det(5A) = 5\det(A)$ ? Let  $A$  be a  $n \times n$  matrix and let  $k$  be a scalar. Find a formula for  $\det(kA)$  in terms of  $k$  and  $\det(A)$ .