APPLICATIONS OF MATRICES AND DETERMINANTS

In this class we will only focus on two applications of matrices. As you have seen, matrices are very useful in solving systems of equations. There is a third way to solve a system using matrices using "Cramer's Rule," but as we are running short of time this year, we will not cover Cramer's Rule. Cryptography (created coded messages and decoding messages) is also a fun topic, but regrettably we have run out of time. If you find you like matrices there are various uses of matrices you can explore in college if you take a linear algebra course.

FINDING THE AREA OF A TRIANGLE USING MATRICES

To find the area of a triangle that has vertices of $(x_1, y_1), (x_2, y_2), (x_3, y_3)$

Solve for

$$\text{Area} = \pm \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

Use ± to make sure the area is a positive value.

When using this formula, you may happen to find that the determinant of the matrix is zero.

If this happens, it means there is not space between the three vertices of the triangle which in turn means **the points are colinear** (the points all lie on one line.)

Find the area of the triangle with vertices of (1,0), (2,2) and (4,3).

$$A = \pm\frac{1}{2}\begin{vmatrix} 1 & 0 & 1 \\ 2 & 2 & 1 \\ 4 & 3 & 1 \end{vmatrix}$$