Explanation for 7.3 Notes

Matrices give us a way to solve systems of linear equations without having to do substitution or elimination in the traditional way you learned in Algebra 2. We are basically doing elimination (because it is MUCH more efficient!) using only the numerical values of the equations when we use matrices to solve systems of linear equations. This is similar to how synthetic division just used the numerical values in polynomial division and was a lot more efficient than long division when it worked.

To solve a system of linear equations using matrices, you need to get the matrix all the way down to what is called reduced row echelon form. Row echelon form is simply an intermediate step to get there.

If we take a look at what I did in example 1 of the 7.3 notes:

1. Take the coefficients of the equations, which are in standard form, and place them in the matrix.
2. Get the matrix into reduced row echelon form to solve the system of equations.
    a. To get into reduced row echelon form (rref on your calculator), go down each column from left to right using row operations to get the left side matrix to look like an identity matrix.
    b. After all the steps you took to get the left side of the matrix to look like the identity matrix, the top row reads that $1x+0y+0z=2$, the middle row reads $0x+1y+0z=-1$, and the third row reads $0x+0y+1z=3$.
3. The right hand column of the matrix, not the “identity matrix” part, is the solution to the system of equations. In this case, the solution would be (2, -1, 3).