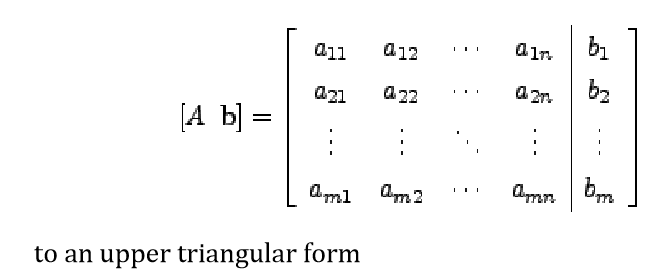
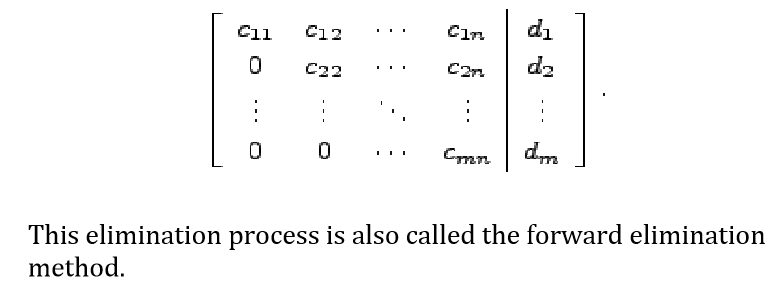
**Solving System of Linear Equation (Cont……)**

**2- Gaussian Elimination Method**

In linear algebra, Gaussian elimination is an algorithm for solving systems of linear equations.

Elementary row operations are used to reduce a matrix to what is called **triangular form. Gaussian elimination** is a method of solving a linear system **Ax=b** (consisting of m equations in n unknowns) by bringing the augmented matrix





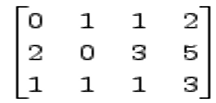
Example: Solve the linear system by Gauss elimination method.

y+z=2

2x+3z=5

x+y+z=3

Solution: In this case, the augmented matrix is



The method proceeds along the following steps.

1. Interchange 1st and 2nd equation .



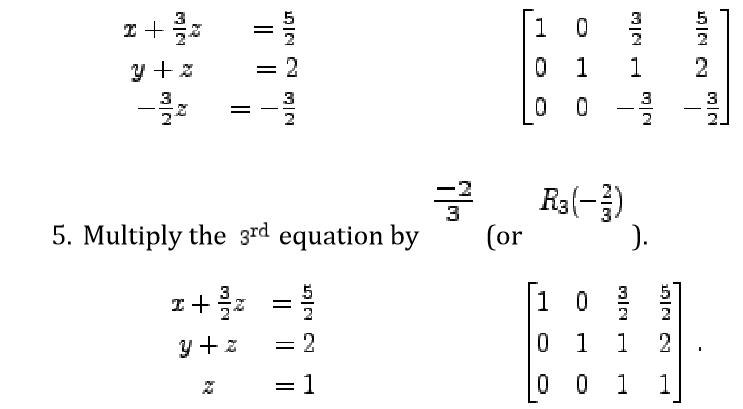
2. Divide the 1st equation by 2 (or **R1\*(1/2)** ).



3. Add -1 times the 1st equation to the 3rd equation (or **R1\*(-1) +R3).**



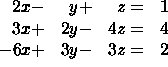
4. Add -1 times 2nd equation to the 3rd equation (or R2\*(-1)+R3 ).



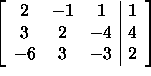
The last equation gives z=1 the second equation now gives y=1 Finally the first equation gives x=1 .

#### Example

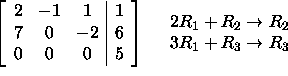
Let's solve the following system of equations:



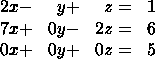
In augmented matrix form we have



We now use the method of Gaussian Elimination:

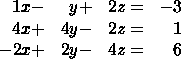


We could proceed to try and replace the first element of row 2 with a zero, but we can actaully stop. To see why, convert back to a system of equations:

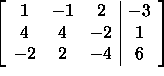


Notice the last equation: 0=5. This is not possible. So the system has no solutions; it is **not possible to find values x, y, and z** that satisfy all three equations simultaneously.

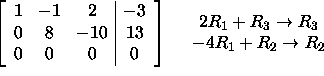
#### Example: Solve



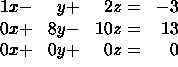
In matrix form:



Using Gaussian Elimination:



Converting back to a system of equations:



**Notice the last equation: 0=0 (this resulted from equation 3 being a linear combination of the other two equations). This is always true. And, we can solve the first two equations to get x and y as functions of z alone**. Solving the second equation we get

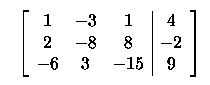
https://math.oregonstate.edu/home/programs/undergrad/CalculusQuestStudyGuides/vcalc/gauss/img17.gif

And for the first equation

https://math.oregonstate.edu/home/programs/undergrad/CalculusQuestStudyGuides/vcalc/gauss/img18.gif

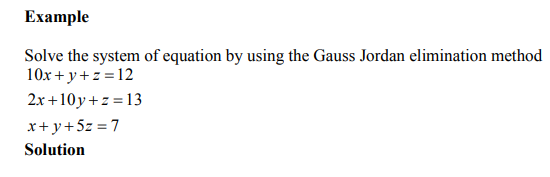
The variable **z in this problem is called a parameter since there are no constraints on what values z may take on**. Thus, there are an infinite number of solutions - one for each value of z. Examples of solutions are (-11/8,13/8,0) and (-17/8,23/8,1) which come from setting z=0 and z=1, respectively. We may concisely write all solutions as triples of the formhttps://math.oregonstate.edu/home/programs/undergrad/CalculusQuestStudyGuides/vcalc/gauss/img19.gif where t is any real number.

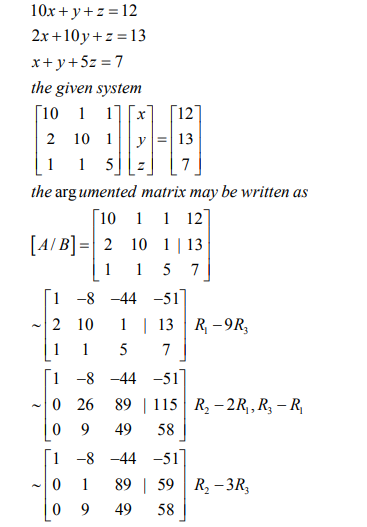
**H.W**: **solve the system linear using** **Gaussian Elimination Method.**

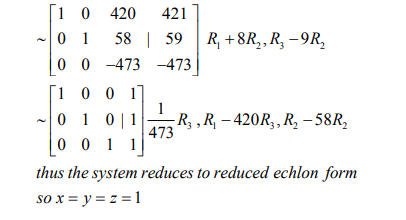


**3-Gaussian Jordan Elimination.**

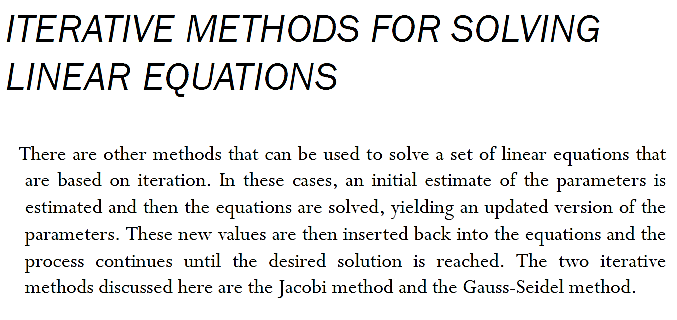
This method is a variation of Gaussian elimination method. In this method, the elements above and below the diagonal are simultaneously made zero. That is a given system is reduced to an equivalent diagonal form using elementary transformations. Then the solution of the resulting diagonal system is obtained.







* **Iterative methods for solving system of linear Equation**



1-Jacobi Iteration Method

