

# Lab #4-B: Algebraic Equations

## Built-in Functions

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LinearSolve

Solve

## Examples

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Example1 : Solve the following equations :

$$\begin{aligned} -12 x_1 + x_2 - x_3 &= -20 \\ -2 x_1 - 4 x_2 + 2 x_3 &= 10 \\ x_1 + 2 x_2 + 2 x_3 &= 25 \end{aligned}$$

## 1- Using "LinearSolve"

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```
In[131]:= a = {{-12, 1, -1}, {-2, -4, 2}, {1, 2, 2}}
```

```
Out[131]= {{-12, 1, -1}, {-2, -4, 2}, {1, 2, 2}}
```

```
In[132]:= b = {-20, 10, 25}
```

```
Out[132]= {-20, 10, 25}
```

```
In[133]:= sol = LinearSolve[a, b]
```

```
Out[133]= {1, 2, 10}
```

## OR

---

```
In[1]:= a = 

|     |    |    |
|-----|----|----|
| -12 | 1  | -1 |
| -2  | -4 | 2  |
| 1   | 2  | 2  |


```

```
Out[1]= {{-12, 1, -1}, {-2, -4, 2}, {1, 2, 2}}
```

```
In[4]:= b = 

|     |
|-----|
| -20 |
| 10  |
| 25  |


```

```
Out[4]= {{-20}, {10}, {25}}
```

```
In[5]:= LinearSolve[a, b]
```

```
Out[5]= {{1}, {2}, {10}}
```

## 2- Using "Solve"

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```
In[6]:= eq1 = -12 x1 + x2 - x3 == -20
        eq2 = -2 x1 - 4 x2 + 2 x3 == 10
        eq3 = x1 + 2 x2 + 2 x3 == 25
```

```
Out[6]= -12 x1 + x2 - x3 == -20
```

```
Out[7]= -2 x1 - 4 x2 + 2 x3 == 10
```

```
Out[8]= x1 + 2 x2 + 2 x3 == 25
```

Solve can be used in two different forms. If variables are not specified, all variables will be solved for.

```
In[144]:= Solve[{eq1, eq2, eq3}]
```

```
In[9]:= {{x1 → 1, x2 → 2, x3 → 10}}
```

```
Out[9]= {{x1 → 1, x2 → 2, x3 → 10}}
```

## OR

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```
In[10]:= x = {x1, x2, x3}
```

```
Out[10]= {x1, x2, x3}
```

```
In[18]:= Solve[a.x == {-20, 10, 25}]
```

```
Out[18]= {{x1 → 1, x2 → 2, x3 → 10}}
```

## Exercises:

1- Solve the equations given in the lab

2- Solve the truss problem in Lab 5-A (the Excel sheet)

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