Solve System of Linear Equations

This section shows you how to solve a system of linear equations using the Symbolic Math Toolbox™.

Solve System of Linear Equations Using linsolve

A system of linear equations

can be represented as the matrix equation , where *A* is the coefficient matrix,

and is the vector containing the right sides of equations,

If you do not have the system of linear equations in the form `AX = B`, use `equationsToMatrix` to convert the equations into this form. Consider the following system.

Declare the system of equations.

```
syms x y z
eqn1 = 2*x + y + z == 2;
eqn2 = -x + y - z == 3;
eqn3 = x + 2*y + 3*z == -10;
```

Use `equationsToMatrix` to convert the equations into the form `AX = B`. The second input to `equationsToMatrix` specifies the independent variables in the equations.

```
[A,B] = equationsToMatrix([eqn1, eqn2, eqn3], [x, y, z])

A =
[  2, 1,  1]
[ -1, 1, -1]
[  1, 2,  3]

B =
   2
   3
 -10
```

Use `linsolve` to solve `AX = B` for the vector of unknowns `X`.

```
X = linsolve(A,B)

X =
   3
   1
  -5
```

From X, $x = 3$, $y = 1$ and $z = -5$.

Solve System of Linear Equations Using solve

Use `solve` instead of `linsolve` if you have the equations in the form of expressions and not a matrix of coefficients. Consider the same system of linear equations.

Declare the system of equations.

```
syms x y z
eqn1 = 2*x + y + z == 2;
eqn2 = -x + y - z == 3;
eqn3 = x + 2*y + 3*z == -10;
```

Solve the system of equations using `solve`. The inputs to `solve` are a vector of equations, and a vector of variables to solve the equations for.

```
sol = solve([eqn1, eqn2, eqn3], [x, y, z]);
xSol = sol.x
ySol = sol.y
zSol = sol.z

xSol =
3
ySol =
1
zSol =
-5
```

`solve` returns the solutions in a structure array. To access the solutions, index into the array.