Solving Systems of Equations

Created using Maple 14.01

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```
> restart;
  with(StringTools) :
  FormatTime("%m−%d−%Y, %H:%M");
```

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This tutorial will show how to use the Maple *solve* command to solve systems of equations. The first example is trivial. *solve* requires two arguments: the first is the equation or system of equations to be solve, and the second is the variable or variables to be solved:

```
> solve(x = 2, x);
```

$$2 \quad \textbf{(2)}$$

This second example is also pretty basic, but involves two equations and two varibles. Notice that the two equations are contained within curly brackets and the two variables are also inside curly brackets.

```
> solve( {x = 2, y = x^2}, {x, y});
```

$$\{x = 2, y = 4\} \quad \textbf{(3)}$$

Here's another system of two equations and two unknowns:

```
> solve( {10·x − 3·y = 5, −2·x − 4·y = 7}, {x, y});
```

$$\left\{x = -\frac{1}{46}, y = -\frac{40}{23}\right\} \quad \textbf{(4)}$$

Here's a more interesting example. It's a system of 6 complex equations and 6 unknowns. This example solves for the currents in an all-pass filter. (Optional experiment in PHYS 231.)

```
> soln := solve( {i1 = i2 + i3, i2 = i4 + i5, i3 + i5 = i6, v − i1·R − I·w·i2·L − i5·R − I·w·i6·L
      = 0, v − i1·R − i3/(I·w·C) − I·w·i6·L = 0, i4/(I·w·C) − i5·R − I·w·i6·L = 0}, {i1, i2, i3, i4, i5,
      i6} );
```

$$soln := \left\{i1 = \frac{1}{2}\,\frac{v\,(-2\,I R w C - 1 + w^2 L C)}{-R - I w L + R w^2 C L - I R^2 w C}, i2 = -\frac{1}{2}\,\frac{(I R w C + 1)\,v}{-R - I w L + R w^2 C L - I R^2 w C}, i3 = \frac{1}{2}\,\frac{v w C\,(-I R + w L)}{-R - I w L + R w^2 C L - I R^2 w C}, i4 = \frac{1}{2}\,\frac{v w C\,(-I R + w L)}{-R - I w L + R w^2 C L - I R^2 w C}, i5 = -\frac{1}{2}\,\frac{(w^2 L C + 1)\,v}{-R - I w L + R w^2 C L - I R^2 w C}, i6 = -\frac{1}{2}\,\frac{(I R w C + 1)\,v}{-R - I w L + R w^2 C L - I R^2 w C}\right\} \quad \textbf{(5)}$$

To access, say the fifth solution, we can do the following:

```
> soln[5];
```

(6)

$$i5 = -\frac{1}{2}\ \frac{\left(w^2 L C + 1\right) v}{-R - \mathrm{I}\, w L + R w^2 C L - \mathrm{I} R^2 w C} \tag{6}$$

> $rhs(soln[5])$

$$-\frac{1}{2}\ \frac{\left(w^2 L C + 1\right) v}{-R - \mathrm{I}\, w L + R w^2 C L - \mathrm{I} R^2 w C} \tag{7}$$

>