

### [11.8] Try *solve()* for symbolic system solutions

Consider this system of equations:

$$\begin{aligned}2x - y + z &= a \\ x + y - 3z &= b \\ 3x - 2z &= c\end{aligned}$$

The solution for  $x$ ,  $y$  and  $z$  depends on the values of  $a$ ,  $b$  and  $c$ . *solve()* can usually find solutions to these kinds of systems. For example,

```
solve(2x-y+z=a and x+y-3z=b and 3x-2z=c,{x,y,z})
```

returns

$$x = \frac{c+2\cdot @1}{3} \text{ and } y = \frac{3\cdot b-c+7\cdot @1}{3} \text{ and } z=@1 \text{ and } a=-(b-c)$$

The notation "@1" indicates an arbitrary constant in the solution. For example, let @1 =  $k$ , then

$$x = \frac{c+2\cdot k}{3} \text{ and } y = \frac{3\cdot b-c+7\cdot k}{3} \text{ and } z=k \text{ and } a=-(b-c)$$

If we let  $k = 5$ ,  $b = 3$  and  $c = 7$ , then  $a = 4$ ,  $x = 17/3$ ,  $y = 37/3$  and  $z = 5$ . These values are solutions to the original system.

*(Credit to Rick Homard)*