

Comprehensive solutions to problems in Maple, using the parametric option.

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It is very common for mathematical problems and mathematical tables to contain parameters. For example, every calculus book contains a table of integrals with entries such as

$$\int x^n dx = \frac{x^{n+1}}{n+1}, \text{ and } \int \cos(ax) dx = \frac{\sin(ax)}{a}.$$

Few books bother to write $a \neq 0$, and it is even less likely that anyone of them adds the comment that $a = 0$ has the integral x . If a user asks Maple for the solution of $ax = a$, should Maple reply $x = 1$, or $x = 1, a \neq 0$ or something else? When a problem with parameters has different solutions depending upon the value actually taken by a parameter, then a list of all possibilities is called a comprehensive solution. Early computer algebra systems did not attempt to return comprehensive solutions. Recently, however, Maple has been extending the range of problems for which it can return comprehensive solutions. A user can usually obtain these solutions by specifying the option ‘parametric’. In this talk a number of examples of where the option is available will be presented as well as on-going projects that will add the option to new problems.

Keywords

Comprehensive solutions, parametric option, Maple.

References

[1] R. M. CORLESS, D. J. JEFFREY, D. R. STOUTEMYER, Integrals of functions containing parameters, *The Mathematical Gazette*. **104**, 412–426, 2020, doi:10.1017/mag.2020.96