

antiderivative that machines can't compute! Compute an antiderivative that machines can't compute! Compute an antiderivative that machines ca

Problem statement Many students now own calculators that can find antiderivatives symbolically. This problem is written in December 2007, and reports on the capability of some of these devices and some other programs.

a) Find $\int \sqrt{1 + \sqrt{x}} dx$.

Hint Any one of several substitutions will do. You can try “the center of the trouble”: $u = \sqrt{1 + \sqrt{x}}$ and describe dx in terms of u and du .

b) Find $\int \sqrt{1 + \sqrt{1 + \sqrt{x}}} dx$.

Hint and comment This can be done *by hand*. Most hand-held devices can't do it.

c) Describe a strategy which will find $\int \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{x}}}} dx$, explain why your strategy will be successful, and explain why you would rather not carry out a detailed implementation of the strategy.

Comment The latest version of the big and powerful symbolic manipulation program **Maple**, available on most Rutgers systems, is unable to find this antiderivative (with the default settings for the program). **Maple's** major competitor, **Mathematica**, considers the integral and returns

`Mathematica could not find a formula for your integral. Most likely
this means that no formula exists.`

which is amusing.

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