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Comparison of homotopy analysis method and homotopy perturbation method through an evolution equation. (English) [Zbl 1221.65281](#)

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Summary: In this paper, the homotopy analysis method (HAM) proposed by Liao in 1992 and the homotopy perturbation method (HPM) proposed by He in 1998 are compared through an evolution equation used as the second example in a recent paper by *D. D. Ganji, H. Tari* and *M. B. Jooybari* [*Comput. Math. Appl.* 54, No. 7–8, 1018–1027 (2007; [Zbl 1141.65384](#))]. It is found that the HPM is a special case of the HAM when $h = -1$. However, the HPM solution is divergent for all x and t except $t = 0$. It is also found that the solution given by the variational iteration method (VIM) is divergent too. On the other hand, using the HAM, one obtains convergent series solutions which agree well with the exact solution. This example illustrates that it is very important to investigate the convergence of approximation series. Otherwise, one might get useless results.

MSC:

65M99 Numerical methods for partial differential equations, initial value and time-dependent initial-boundary value problems Cited in **41** Documents

Keywords:

homotopy analysis method (HAM); analytical solution; convergence; symbolic computation

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