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# THERMAL SCIENCE

## International Scientific Journal

[Timothy G. Myers](#), [Sarah L. Mitchell](#)

### APPLICATION OF THE HEAT-BALANCE AND REFINED INTEGRAL METHODS TO THE KORTEWEG-DE VRIES EQUATION

#### ABSTRACT

In this paper we consider approximate travelling wave solutions to the Korteweg-de Vries equation. The heat-balance integral method is first applied to the problem, using two different quartic approximating functions, and then the refined integral method is investigated. We examine two types of solution, chosen by matching the wave speed to that of the exact solution and by imposing the same area. The first set of solutions is generally better with an error that is fixed in time. The second set of solutions has an error that grows with time. This is shown to be due to slight discrepancies in the wave speed.

#### KEYWORDS

[Korteweg-de Vries](#), [heat-balance integral method](#), [refined integral method](#), [travelling wave](#)

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REFERENCES [view full list]

1. Goodman, T. R., The Heat-Balance Integral and Its Application to Problems Involving a Change of Phase, *Trans. ASME*, 80 (1958), 2, pp. 335-342
2. Carslaw, H. S., Jaeger, J. C., *Conduction of Heat in Solids*, 1st ed., Clarendon Press, Oxford, UK, 1959
3. Crank, J., *The Mathematics of Diffusion*, 2nd ed., Oxford University Press, USA, 1975
4. \*\*\*, The Heat Equation, [http://en.wikipedia.org/wiki/Heat\\_equation](http://en.wikipedia.org/wiki/Heat_equation), last accessed May 29th, 2008
5. Pohlhausen, K., Zur näherungsweise Integration der Differentialgleichungen der laminaren Reibungsschicht, *Z. angew. Math. Mech.*, 1 (1921), pp. 252-258
6. Schlichting, H., *Boundary Layer Theory*, 8th ed., Springer-Verlag, Berlin, 2000
7. Kulluay, S., Bahadir, A. R., Ozdes, A., A Small Time Solutions for the Korteweg-deVries

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- equation. *Appl. Math. Comp.* 107 (2000), 2-3, pp. 203-210
8. Mitchell, S. L., Myers, T. G., The Application of Standard and Refined Heat Balance Integral Methods to One-Dimensional Stefan Problems, to appear *SIAM Review*, June 2008
  9. Sadoun, N., Si-Ahmed, E-K., Colinet, P., On the Refined Integral Method for the One-Phase Stefan Problem with Time-Dependent Boundary Conditions, *App. Math. Modelling*, 30 (2006), 6, pp. 531-544
  10. Wood, A. S., A New Look at the Heat Balance Integral Method, *App. Math. Modelling*, 25 (2001), 10, pp. 815-824
  11. Myers, T. G., et al., A Cubic Heat Balance Integral Method for One-Dimensional Melting of a Finite Thickness Layer, *Int. J. Heat and Mass Trans.*, 50 (2007), 25-26, pp. 5305-5317
  12. Antic, A., Hill, J. M., The Double-Diffusivity Heat Transfer Model for Grain Stores Incorporating Microwave Heating. *Appl. Math. Modelling*, 27 (2003), 8, pp. 629-647
  13. Mitchell, S. L., Myers, T. G., A Heat Balance Integral Method for One-Dimensional Finite Ablation, *J. Thermophys Heat Trans.*, 22 (2008), 3, pp. 508-514
  14. Braga, W. F., Mantelli, M. B. H., Azevedo, J. L. F., Approximate Analytical Solution for One-Dimensional Ablation Problem with Time-Variable Heat Flux, *AIAA Paper 2003-4047*, 2003
  15. Braga, W. F., Mantelli, M. B. H., Azevedo, J. L. F., Approximate Analytical Solution for One-Dimensional Ablation Problem with Constant Time Heat Flux. *AIAA Paper 2004-2275*, 2004

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