1106-39-363 **Ronald E. Mickens*** (rmickens@cau.edu), Clark Atlanta University, Physics Department, Atlanta, GA 30314. *Exact Finite Difference Schemes for the Cauchy-Euler Equation: Application to the Black-Sholes Equation.*

Consider the following Cauchy-Euler equation

$$x^2 y'' + bxy' + cy = 0, \tag{1}$$

where (a, b, c) are constants. Observe that this is a linear, second-order differential equation, having the property of scale-invariance, i.e., under the transformation, $x \longrightarrow \lambda x$, the form of the equation does not change. Using its solutions, we construct an exact finite difference discretization for this ODE and use the result to then formulate several finite difference schemes for the Black-Shole equation[1)] of mathematical finance by means of the method of subequations.[2)]

References

1) Paul Wilmott et al., The Mathematics of Financial Derivatives (Cambridge University Press, New York, 1995); see Chapters 3 and 8.

2) R.E. Mickens, Nonstandard Finite Difference Models of Differential Equations (World Scientific, River Edge, NJ, 1994). (Received August 25, 2014)