Solutions to a Modified Newtonian Dynamics Force Law

RONALD MICKENS, Clark Atlanta University — We consider a specific relation for a modified Newtonian force law in one space dimension:

\[ \frac{m|a|a}{a_0 + |a|} = F(x), \]

where \( a = \frac{d^2x}{dt^2} \) and \( a_0 \) is a very small “cosmic” related acceleration. Exact solutions are calculated for zero, constant, and linear damping forces. However, the linear harmonic oscillator force situation could not be solved exactly and, as a consequence, an approximation to the periodic solutions was determined. To check the consistency of the calculations, we took the \( a_0 \to 0 \) limits and found that the prior known results were obtained for all four systems.