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Title : Analytic solutions to certain equations from a cell division equation

Abstract : A simple model for cell growth and division into α>1 daughter cells of equal size is given by the functional pde

$$\frac{\partial}{\partial x}\left(G(x)n(x,t)\right)+\frac{\partial}{\partial t}n(x,t)+B(x)n(x,t)=\alpha^2 B(\alpha x)n(\alpha x,t).$$

Here, *n* denotes the number density of cells of size *x* at time *t*, *G* is the growth rate, and *B* is the division rate. (« Size » is usually measured by mass or DNA content.) The differential equation is supplemented by the condition

$$n(x,0)=n_0(x),$$

where n_0 is the initial cell size distribution, and the boundary conditions

$$\lim_{x\to 0^+} G(x)n(x,t)=0,$$

The problem is of the initial-boundary value type, and there is a paucity of analytical solution techniques for these problems. It is possible, however, to solve the problem for some simple cases of interest. In this talk I shall outline two such cases that use very different approaches and whose solutions have markedly different asymptotics. These solutions provide a concrete illustration of a more general theory that has evolved for such systems.