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

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

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

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.