1044-34-86   **Stuart Hastings*** (`sph@pitt.edu`), Department of Mathematics, University of Pittsburgh, Pittsburgh, PA 15218. *An elementary and rigorous approach to a model problem of Lagerstrom in matched asymptotic expansions.*

The equation studied is $u'' + \frac{n-1}{r}u' + \varepsilon u\,u' + ku'^2 = 0$, with boundary conditions $u(1) = 0$, $u(\infty) = 1$. This model equation has been studied by many authors since it was introduced in the 1950s by P. A. Lagerstrom. We use an elementary approach to show that there is an infinite series solution which is uniformly convergent on $1 \leq r < \infty$. The first few terms are easily derived, from which one quickly deduces the inner and outer asymptotic expansions, with no matching procedure or a priori assumptions about the nature of the expansion. We also give a very short and elementary existence and uniqueness proof which covers all $\varepsilon > 0$, $k \geq 0$, and $n \geq 1$. This work is joint with J. B. McLeod. (Received August 22, 2008)