1 Introduction

Computations of fluid flow sometimes lead to unusual problems in the solution of ordinary di erential equations. The present problem comes from a paper by O'Neill and Stewartson [1]. The problem posed is an excellent test case for the application of computer algebra systems, such as MAPLE, to scientific computation. A function $A(s)$ satisfies the di erential equation

$$s^3 K' A'' + sA'[s^2 K'' + 3 s K' + 2 K] - A[s^2 K \infty\infty$$

$s = 0$ and an irregular point at infinity. In terms of this function, constants k_1 and k_2 must be calculated according to the formulae

$$k_1 = \frac{4}{5} + \frac{1}{2}\int_0^{\infty} \Bigg\{ A + \frac{3}{5s^2}\left[2s\,\mathrm{csch}^2 s - (\coth s - 1)(1 + 2s + s^2\,\mathrm{csch}^2 s)\right] - \frac{3}{5}e^{-2s}\left[\frac{1}{s^3} + \frac{1}{s^2} + \frac{2}{3s} + \frac{5}{3}(2s-1)\coth s\right] - \frac{3}{5}\left[\frac{2}{s^3} - \left(\frac{3}{s^2} + \frac{2}{s}\right)(\coth s - 1)\right]\Bigg\}\, ds, \qquad (2)$$

$$k_2 = \frac{1}{5} + \frac{1}{}$$

[illegible]

where

$$b_{-2} = -\frac{3}{5}\ , \qquad b_0 = -\frac{6}{25} \tag{6}$$

$$b_2 = -\frac{107}{1575}, \qquad b_4 = \frac{394}{307125} \tag{7}$$

We reject the other homogeneous solution because asymptotically it behaves as $O(s^{-2-\sqrt{10}})$, for small values of s