

## Homework 3

**Problem 1:** Do problem page 84.

**Problem 2:** Show that the Linsted-Poincaré method is a special case of the Lighthill method by expressing the coefficient-functions  $\omega_i(\tau)$  of the latter in terms of the scalar coefficients  $\omega_i$  of the former.

**Problem 3:** Do problem 2 part 3 (iii) page 97.

*For extra practice:* Do problem 2 parts 1 and 2 (i and ii) page 97.

**Problem 4:** Using one of the various methods of strained coordinates learned in lectures, find a *uniformly valid* 1-term expansion of the solution (i.e. with a 2-term expansion for the strained coordinate):

- $f'' + \left(2 - \frac{1}{\sqrt{1+\epsilon^2 f^2}}\right) f = 0$ , with  $f(0) = 1$  and  $f'(0) = 0$ .
- $f'' + f + (e^{\epsilon f} - 1) = 0$ , with  $f(0) = 1$ , and  $f'(0) = 0$ .

**Problem 5:** Read the note on the failure of renormalization page 96, and do problem 4 page 97.