implies that

$$W_{ki}^{(0)} = A_i \delta_{ki},$$

where usually we think of A_i depending only on x. Here A_i also depends on both ζ and t (for example, the time dependence determined via (1.2) could imply $A_2 = \exp(i\zeta^3 t)$). By considering the next order equation, $O(1)$, the x dependence of A_i may be obtained:

$$i(d_k - d_i) W_{ki}^{(1)} = \frac{\partial}{\partial x} W_{ki}^{(0)} - \sum_m N_{km} W_{mi}^{(0)} = \frac{\partial A_i}{\partial x} \delta_{ki} - A_i N_{ki}.$$

Since $N_{ii} = 0$, $\partial A_i / \partial x = 0$ and

$$W_{ki}^{(1)} = \begin{cases} 0, & k = i, \\ -N_{ki} A_i / i(d_k - d_i), & k \neq i, \end{cases}$$

where $W_{ii}^{(1)} = 0$, because $W_{ii}^{(1)} \neq 0$ is equivalent to the introduction in A_i of $O(1/\zeta)$ term. In a similar way, the higher order terms may be directly calculated. Note that the equations for $W_{ki}^{(p)}$ will be linear. From these results we see that

$$V_{ki} = A_i(\zeta, t) \exp(i\zeta d_i x)[\delta_{ki} + O(1/\zeta)].$$

By considering the variables $\Gamma_{ki} = V_{ki}/V_{ii}$, the as yet unknown expression $A_i(\zeta, t)$ will be of no importance.

[1]C. S. Gardner, J. M. Greene, M. D. Kruskal, and R. M. Miura, Phys. Rev. Lett. 19, 1095 (1967).
[2]C. S. Gardner, J. M. Greene, M. D. Kruskal, and R. M. Miura, Comm. Pure Appl. Math. 27, 97 (1974).
[3]V. E. Zakharov and A. B. Shabat, Zh. Eksp. Teor. Fiz. 61, 118 (1971) [Sov. Phys. JETP 34, 62 (1972)].
[4]P. D. Lax, Comm. Pure Appl. Math. 21, 467 (1968).
[5]M. J. Ablowitz, D. J. Kaup, A. C. Newell, and H. Segur, Phys. Rev. Lett. 31, 125 (1973).
[6]M. J. Ablowitz, D. J. Kaup, A. C. Newell, and H. Segur, Stud. Appl. Math. 53, 249 (1974).
[7]V. E. Zakharov and S. V. Manakov, Zh. Eksp. Teor. Fiz. Pis. Red. 18, 413 (1973) [Sov. Phys. JETP Lett. 18, 243 (1973)].
[8]M. J. Ablowitz and R. Haberman, J. Math. Phys. 16, 2301 (1975).
[9]R. M. Miura, C. S. Gardner, and M. D. Kruskal, J. Math. Phys. 9, 1204 (1968).
[10]K. Konno, H. Sanuki, and Y. H. Ichikawa, Prog. Theor. Phys. 52, 886 (1974).
[11]H. Sanuki and K. Konno, Phys. Lett. A 48, 221 (1974).
[12]M. Wadati, H. Sanuki, and K. Konno, Prog. Theor. Phys. 53, 419 (1975).
[13]E. A. Coddington and N. Levinson, *Theory of Ordinary Differential Equations* (McGraw-Hill, New York, 1955).
[14]A. H. Nayfeh, *Perturbation Methods* (Wiley, New York, 1973).

Addendum: A classical perturbation theory [J. Math. Phys. 18, 110 (1977)]

Charles Schwartz

Department of Physics, University of California, Berkeley, California 94720

(Received 13 February 1977)

[3]J. K. Percus, Comm. Pure Appl. Math. 17, 137 (1964).