11. *Studies on Holonomic Quantum Fields. VII*

By Mikio SATO, Tetsuji MIWA, and Michio JIMBO
Research Institute for Mathematical Sciences, Kyoto University

(Communicated by Kôsaku YOSIDA, M. J. A., Feb. 13, 1978)

In [1] we have constructed field operators $\varphi_F(x)$ and $\varphi^F(x)$, which satisfy a simple commutation relation with the auxiliary free fermi field $\psi(x)$ ((37) in [2]). This commutation relation implies a remarkable monodromy structure of the wave function $\langle\psi(x)\varphi_F(a_1)\cdots\varphi^F(a_\nu)\cdots\varphi_F(a_n)\rangle$. Namely, as a function of x it changes the sign when prolonged around each branch point a_μ ($\mu=1,\cdots,n$).

The present note deals with the following three topics, extending the above mentioned results.

i) Construction of operators with arbitrary exponents of local monodromy.

ii) Construction of an $n(n-1)/2$ parameter family of wave functions with different global monodromy structures.

iii) Computation of global monodromy at degenerate fibers in the above family.

1. Let $\psi(u)$, $\psi^*(u)$ $(u>0)$ and $\psi^\dagger(u)\underset{\text{def}}{=}\psi^*(-u)$, $\psi^{*\dagger}(u)\underset{\text{def}}{=}\psi(-u)$ $(u>0)$ denote annihilation and creation operators, respectively. They satisfy the following.

(1)
$$\begin{pmatrix}[\psi(u),\psi(u')]_+ & [\psi(u),\psi^*(u')]_+\\ [\psi^*(u),\psi(u')]_+ & [\psi^*(u),\psi^*(u')]_+\end{pmatrix}$$
$$=\begin{pmatrix}\langle\psi(u),\psi(u')\rangle & \langle\psi(u),\psi^*(u')\rangle\\ \langle\psi^*(u),\psi(u')\rangle & \langle\psi^*(u),\psi^*(u')\rangle\end{pmatrix}$$
$$=\begin{pmatrix}0 & 2\pi|u|\,\delta(u+u')\\ 2\pi|u|\,\delta(u+u') & 0\end{pmatrix},$$

(2)
$$\begin{pmatrix}\langle\psi(u)\psi(u')\rangle & \langle\psi(u)\psi^*(u')\rangle\\ \langle\psi^*(u)\psi(u')\rangle & \langle\psi^*(u)\psi^*(u')\rangle\end{pmatrix}$$
$$=\begin{pmatrix}0 & 2\pi u_+\delta(u+u')\\ 2\pi u_+\delta(u+u') & 0\end{pmatrix}.$$

We set

(3)
$$\psi_l(x)=\int \underline{du}(0+iu)^l e^{-im(x^-u+x^+u^{-1})}\psi(u),$$
$$\psi_l^*(x)=\int \underline{du}(0+iu)^l e^{-im(x^-u+x^+u^{-1})}\psi^*(u),$$

where $l\in \boldsymbol{C}$ and $(0+iu)^l=e^{\pm\pi il/2}|u|^l$ if $u\gtrless 0$. We abbreviate $\psi_{\pm1/2}(x)$ (resp. $\psi^*_{\pm1/2}(x)$) to $\psi_\pm(x)$ (resp. $\psi^*_\pm(x)$) and set

$$\psi(x)={}^t(\psi_+(x),\psi_-(x)),\qquad \psi^*(x)={}^t(\psi^*_+(x),\psi^*_-(x)).$$