$$\cdots + m_{2g}\begin{pmatrix}\int_{\delta_{2g}}\omega_1\\ \vdots \\ \int_{\delta_{2g}}\omega_g\end{pmatrix} = \begin{pmatrix}\int_\gamma \omega_1\\ \vdots\\ \int_\gamma \omega_g\end{pmatrix} \Leftrightarrow \sum_{\lambda'}\int_{\alpha_{\lambda'}}\omega_i = \int_\gamma \omega_i .$$

$$\Rightarrow N^{g+i} = \sum_{\lambda'}\int_{\alpha_{\lambda'}}\omega_i = \int_\gamma \omega_i .$$

Set $\eta' = \eta - \sum_{k=1}^{g} m_{g+k}\omega_k$.

The periods N'^{i} of η' are then given by

$$N'^{i} = -m_{g+i}, \quad i=1,\cdots g,$$

$$\begin{aligned} N'^{g+i} &= N^{g+i} - \sum_{k=1}^{g} m_{g+k}\int_{\delta_{g+i}}\omega_k \\ &= \sum_{k=1}^{2g} m_k \int_{\delta_k}\omega_i - \sum_{k=1}^{g} m_{g+k}\int_{\delta_{g+i}}\omega_k \\ &= m_i + \sum_{k=1}^{g} m_{g+k}\left(\int_{\delta_{g+k}}\omega_i - \int_{\delta_{g+i}}\omega_k\right) = m_i \end{aligned}$$

by the first bilinear relation of Riemann. Thus η' has all integral periods, and $D=(f)$ for $f(p) = \exp(2\pi\sqrt{-1}\int_{p_0}^{p}\eta')$.

$\ulcorner$ $N'^{i} = \int_{\delta_i}\eta' = \int_{\delta_i}\eta - \sum_{k=1}^{g} m_{g+k}\omega_k = -m_{g+i}\int_{\delta_i}\omega_i = -m_{g+i}$

since $\int_{\delta_i}\eta = 0 = \int_{\delta_i}\omega_j = 0$ if $j \neq i$.

$$N^{g+i} = \int_\gamma \omega_i = \int_{\sum m_k\delta_k}\omega_i = \sum m_k\int_{\delta_k}\omega_i = \sum_{k=1}^{g} m_k\int_{\delta_k}\omega_i$$

$$+ \sum_{k=g+1}^{2g} m_k\int_{\delta_k}\omega_i = m_i + \sum_{k=g+1}^{2g} m_k\int_{\delta_k}\omega_i$$