$$\phi_{\mathrm{I}} = (y - y_c) \left[1 + \sum_{n=1}^{\infty} A_n (y - y_c)^n \right]$$

$$\phi_{\mathrm{II}r} = 1 + \sum_{n=1}^{\infty} B_n (y - y_c)^n - \frac{Q'(y_c)}{U'(y_c)} \phi_{\mathrm{I}} \log |y - y_c|$$

$$\phi_{\mathrm{II}i} = \begin{cases} \pi \dfrac{Q'(y_c)}{U'(y_c)} \phi_{\mathrm{I}} & (y < y_c) \\ 0 & (y > y_c) \end{cases}$$