$$v_k^{(q)}(0) = \lim_{a \to \infty} \frac{w_k^{(q)}(a)}{W_k^{(q)}(a)} = \delta_k \int_{b_k}^{\infty} e^{-\varphi_k(q)z} w_{k-1}^{(q)\prime}(z)dz.$$