$$k(\tau,\ell) = (-1)^{\ell+1}\,\mathcal{B}\,\frac{\Gamma\left(\frac{2}{3}-\frac{\tau}{2}\right)}{\Gamma\left(\frac{4}{3}-\frac{\tau}{2}\right)}\,\frac{\Gamma\left(\frac{\tau}{2}+\ell+\frac{1}{6}\right)}{\Gamma\left(\frac{\tau}{2}+\ell+\frac{5}{6}\right)}\,,$$