$$J_\nu(z) = \left(\frac{z}{2}\right)^\nu \sum_{k=0}^{\infty} \frac{(-1)^k}{k!\,\Gamma(\nu+k+1)} \left(\frac{z}{2}\right)^{2k} \tag{17.1.2a}$$

$$\mathsf{j}_n(z) = \sqrt{\frac{\pi}{2z}} \left(\frac{z}{2}\right)^{n+\frac{1}{2}} \sum_{k=0}^{\infty} \frac{(-1)^k}{k!\,\Gamma\left(\left(n+\frac{1}{2}\right)+k+1\right)} \left(\frac{z}{2}\right)^{2k} \tag{17.1.12a}$$

$$J_\nu(z) = \frac{e^{-Iz}\left(\frac{z}{2}\right)^\nu}{\Gamma(\nu+1)} \sum_{k=0}^{\infty} \frac{\left(\nu+\frac{1}{2}\right)_k (2i)^k\, z^k}{(2\nu+1)_k k!} \tag{17.1.22}$$

$$\mathsf{j}_n(z) = \frac{\sqrt{\pi}}{(2n+1)\,\Gamma\left(n+\frac{1}{2}\right)} \left(\frac{z}{2}\right)^n \sum_{k=0}^{\infty} \frac{\frac{1}{\left(n+\frac{3}{2}\right)_k} \left(\frac{-z^2}{4}\right)^k}{k!} \tag{17.1.25}$$

$$\mathsf{j}_n(z) = \frac{\sqrt{\pi} e^{-Iz}}{(2n+1)\,\Gamma\left(n+\frac{1}{2}\right)} \left(\frac{z}{2}\right)^n \sum_{k=0}^{\infty} \frac{\frac{(n+1)_k}{(2n+2)_k} (2iz)^k}{k!} \tag{17.1.26}$$

$$J_\nu(z) = \sqrt{\frac{2}{\pi z}} \left(\frac{(-1)^k\,(\nu, 2k)}{(2z)^{2k}} \cos\left(z - \left(\frac{\nu}{2}+\frac{1}{4}\right)\pi\right) - \frac{(-1)^k\,(\nu, 2k+1)}{(2z)^{2k+1}} \sin\left(z - \left(\frac{\nu}{2}+\frac{1}{4}\right)\pi\right)\right), z \to \infty \tag{17.1.28}$$

$$Y_\nu(z) = \sqrt{\frac{2}{\pi z}} \left(\frac{(-1)^k\,(\nu, 2k)}{(2z)^{2k}} \sin\left(z - \left(\frac{\nu}{2}+\frac{1}{4}\right)\pi\right) + \frac{(-1)^k\,(\nu, 2k+1)}{(2z)^{2k+1}} \cos\left(z - \left(\frac{\nu}{2}+\frac{1}{4}\right)\pi\right)\right), z \to \infty \tag{17.1.29}$$

$$\frac{J_{\nu+1}(z)}{J_\nu(z)} = \frac{\frac{z}{2\nu+2}}{1} + \mathop{\mathrm{K}}_{m=2}^{\infty} \frac{\frac{(iz)^2}{4(\nu+m-1)(\nu+m)}}{1} \tag{17.1.38}$$

$$\frac{\mathsf{j}_{n+1}(z)}{\mathsf{j}_n(z)} = \frac{\frac{z}{2n+3}}{1} + \mathop{\mathrm{K}}_{m=2}^{\infty} \frac{\frac{(iz)^2}{4\left(n+\frac{1}{2}+m-1\right)\left(n+\frac{1}{2}+m\right)}}{1} \tag{17.1.39}$$

$$\frac{J_{\nu+1}(z)}{J_\nu(z)} = -1 \mathop{\mathrm{K}}_{m=1}^{\infty} \frac{-1}{\frac{2(\nu+m)}{z}} \tag{17.1.40}$$

$$\frac{H^{(1)}_{\nu+1}(z)}{H^{(1)}_\nu(z)} = \frac{-1}{1} + \mathop{\mathrm{K}}_{m=2}^{\infty} \frac{\frac{m-3-2\nu}{-2iz}}{1} \tag{17.1.44}$$

$$\frac{J_{\nu+1}(z)}{J_\nu(z)} = \frac{z}{2\nu+2-iz} + \mathop{\mathrm{K}}_{m=2}^{\infty} \frac{(2\nu+2m-1)\,iz}{2\nu+m+1-(2i)\,z} \tag{17.1.48}$$

$$\frac{\mathsf{j}_{n+1}(z)}{\mathsf{j}_n(z)} = \frac{z}{2n+3-iz} + \mathop{\mathrm{K}}_{m=2}^{\infty} \frac{2\,(n+m)\,iz}{2n+m+2-(2i)\,z} \tag{17.1.49}$$

$$\frac{H_{\nu+1}^{(1)}(z)}{H_{\nu}^{(1)}(z)} = \frac{2\nu+1-2iz}{2z} - \frac{1}{z} \mathop{\mathrm{K}}_{m=1}^{\infty} \frac{\nu^2 - \frac{(2m-1)^2}{4}}{2\left(iz-m\right)} \tag{17.1.51}$$