Bessel Functions

Two linearly independent solutions to the Bessel equation of order \( \nu \)

\[
\frac{z^2 d^2 y}{dz^2} + z \frac{dy}{dz} + (z^2 - \nu^2)y = 0
\]

are given by \( J_\nu(z) \), \( Y_\nu(z) \).

\( J_\nu(z) \) vs. \( z \) for \( n = 0, 1, 2, 3 \) (in increasing order of thickness).

Here is a plot of \( J_\nu(z) \) for various integral \( \nu \). Note that only \( J_0 \) is nonzero at \( z = 0 \). Note also that the zeroes *interlace*; that is,

\[
{\dot{j}_{i-1,k}} < {\dot{j}_{i,k}} < {\dot{j}_{i+1,k}} \text{ for all } i, k.
\]
$Y_\nu(z)$ vs. $z$ for $n = 0, 1, 2, 3$ (in increasing order of thickness).

Here is a plot of $Y_\nu(z)$ for various integral $\nu$. Note that all diverge as $z \to 0$. Note also that the zeroes interlace.