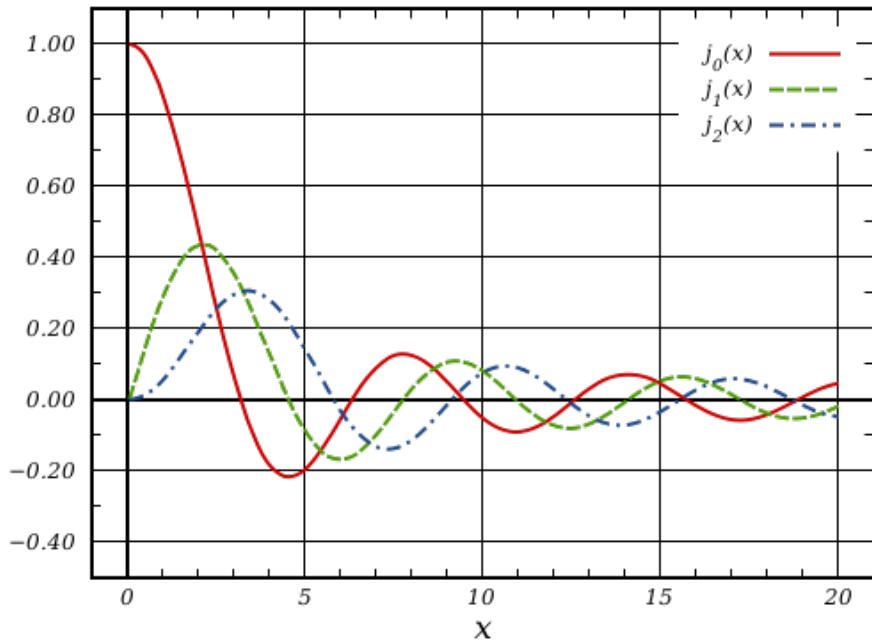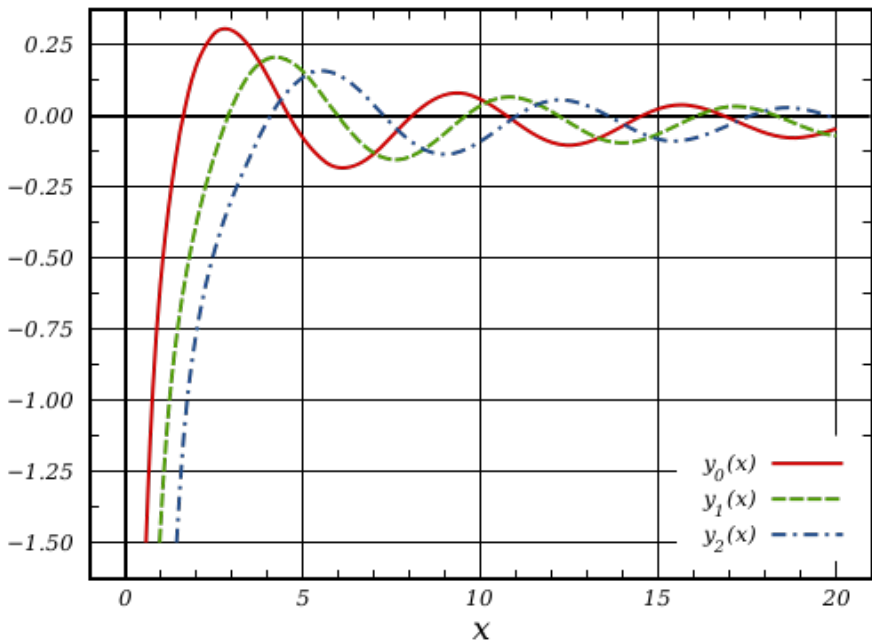# Spherical Bessel and Neumann functions: j_n, y_n

$$j_\ell(x) \equiv (-x)^\ell \left(\frac{1}{x} \frac{d}{dx} \right)^\ell \frac{\sin x}{x}$$

$$j_0(x) = \frac{\sin(x)}{x}$$

$$j_1(x) = \frac{\sin(x)}{x^2} - \frac{\cos(x)}{x}$$

$$j_2(x) = \left(\frac{3}{x^2} - 1 \right) \frac{\sin(x)}{x} - \frac{3\cos(x)}{x^2}$$

$$y_\ell(x) \equiv -(-x)^\ell \left(\frac{1}{x} \frac{d}{dx} \right)^\ell \frac{\cos x}{x}$$

$$y_0(x) = -j_{-1}(x) = -\frac{\cos(x)}{x}$$

$$y_1(x) = j_{-2}(x) = -\frac{\cos(x)}{x^2} - \frac{\sin(x)}{x}$$

$$y_2(x) = -j_{-3}(x) = \left(-\frac{3}{x^2} + 1 \right) \frac{\cos(x)}{x} - \frac{3\sin(x)}{x^2}$$

https://en.wikipedia.org/wiki/Bessel_function