

Generating functions for Legendre and Bessel functions

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Legendre polynomial:

$$G(z, h) = \frac{1}{\sqrt{1 - 2zh + h^2}} = \sum_{n=0}^{\infty} P_n(z)h^n$$

Cosine law :

$$\begin{aligned}c^2 &= a^2 + b^2 - 2ab\cos(\phi) \\c &= a\sqrt{1 + (b/a)^2 - 2(b/a)\cos(\phi)} \\1/c &= \frac{1}{a\sqrt{1 + (b/a)^2 - 2(b/a)\cos(\phi)}}\end{aligned}$$

where

$$\begin{aligned}h &= b/a \\ \cos(\phi) &= z\end{aligned}$$

Bessel function:

$$\begin{aligned}\exp^{\frac{z}{2}(h - \frac{1}{h})} &= \sum_{n=0}^{\infty} J_n(z)h^n \\ J_n(z) &= \frac{1}{\pi} \int_0^{\pi} \cos(n\theta - z\sin(\theta))d\theta\end{aligned}$$

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