

# Orthogonal Polynomials and Recurrence Coefficients

Name	Notation	Polynomial	Weight Fn.	Interval	$\alpha_k$	$\beta_k$
Legendre	$l_m$	$[(x^2 - 1)^m]^{(m)}$	1	$[-1, 1]$	0	$\beta_0 = 2,$ $\beta_k = (4 - k^{-2})^{-1}, k \geq 1$
Chebyshev 1 <sup>st</sup>	$T_m$	$\cos(m \arccos x)$	$(1 - x^2)^{-\frac{1}{2}}$	$[-1, 1]$	0	$\beta_0 = \pi,$ $\beta_1 = \frac{1}{2},$ $\beta_k = \frac{1}{4}, k \geq 2$
Chebyshev 2 <sup>nd</sup>	$Q_m$	$\frac{\sin[(m+1) \arccos x]}{\sqrt{1-x^2}}$	$(1 - x^2)^{\frac{1}{2}}$	$[-1, 1]$	0	$\beta_0 = \frac{\pi}{2},$ $\beta_k = \frac{1}{4}, k \geq 1$
Laguerre	$L_m^a$	$x^{-a} e^x (x^{m+a} e^{-x})^{(m)}$	$x^a e^{-x}, a > -1$	$[0, \infty)$	$2k + a + 1$	$\beta_0 = \Gamma(1 + a),$ $\beta_k = k(k + a), k \geq 1$
Hermite	$H_m$	$(-1)^m e^{x^2} (e^{-x^2})^{(m)}$	$e^{-x^2}$	$\mathbb{R}$	0	$\beta_0 = \sqrt{\pi},$ $\beta_k = \frac{k}{2}, k \geq 1$