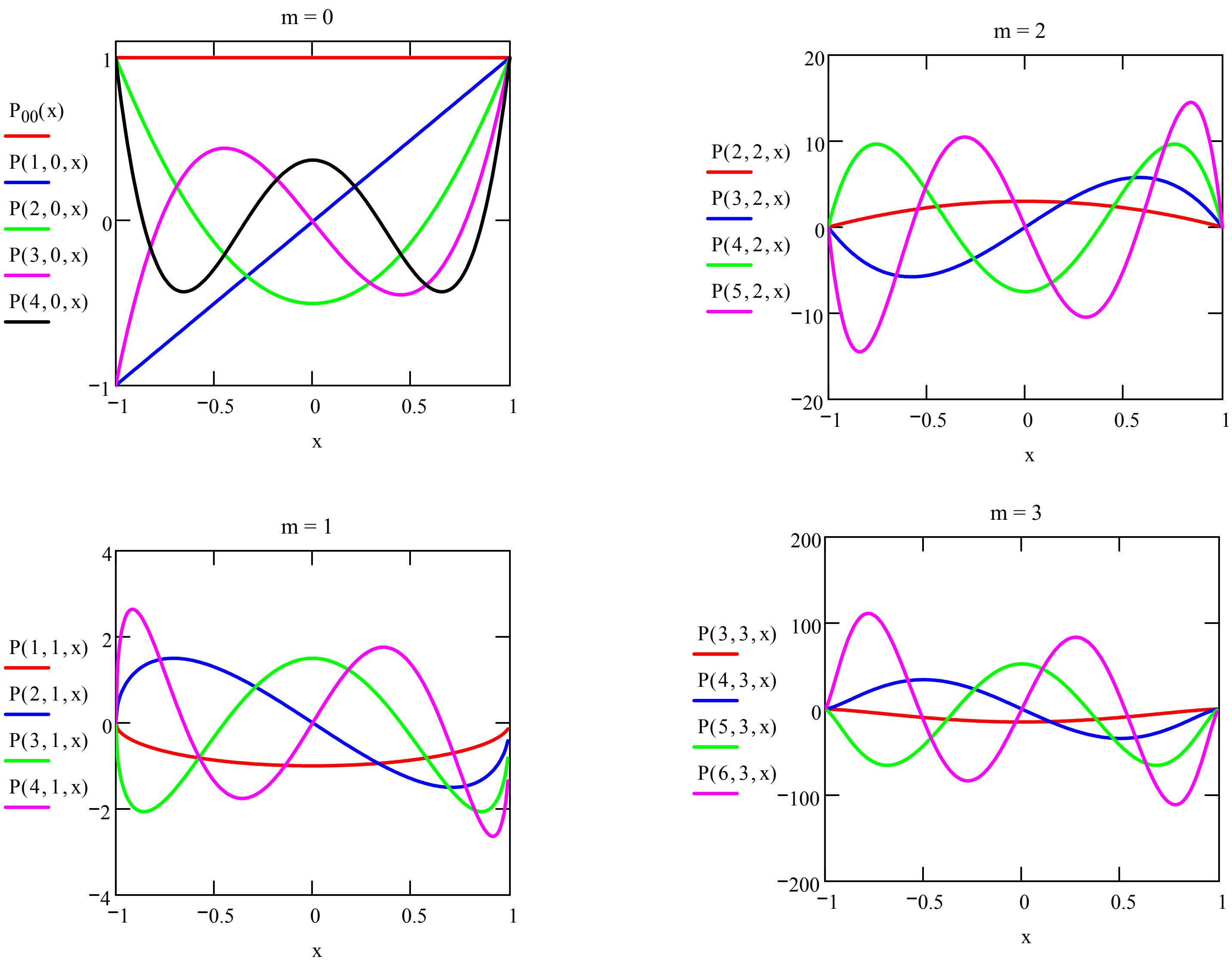
Some Associated Legendre Functions

(m=0 are Legendre Polynomials)

$P_{l,m}(x)$



Legendre Functions of the Second Kind
m=0

The first few m=0 functions

$$Q_0(x) := \frac{1}{2}\cdot\ln\left(\frac{1+x}{1-x}\right) \qquad Q_1(x) := \frac{x}{2}\cdot\ln\left(\frac{1+x}{1-x}\right) - 1 \qquad Q_2(x) := \frac{3\cdot x^2 - 1}{4}\cdot\ln\left(\frac{1+x}{1-x}\right) - \frac{3\cdot x}{2}$$

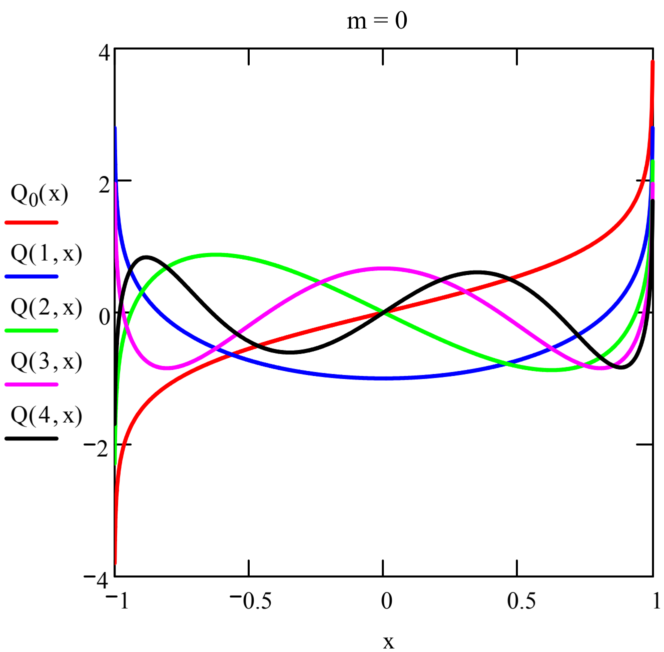
A more general expression in terms of the $P_{l,0}(x)$'s

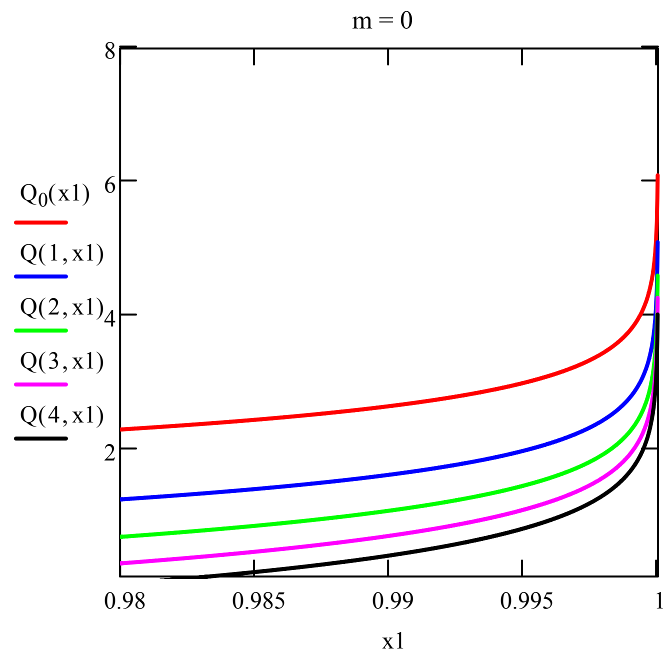
$$Q(L,x) := \left(\frac{1}{2}\cdot P(L,0,x)\cdot\ln\left(\frac{1+x}{1-x}\right)\right) - \sum_{m=1}^{L}\left[\frac{1}{m}\cdot(P(m-1,0,x)\cdot P(L-m,0,x))\right]$$

$x1 := 0.9, 0.90001 .. 0.99999$

$x := -1, -0.999 .. 1$

The Qn(x) 's diverge at x = -1, 1





$P_{l,m}(\cos(\theta))$