Leading–order asymptotic for Legendre polynomials

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The generating function for Legendre polynomials is, as it's well–known,

$$\frac{1}{\sqrt{1-2t\cos\theta+t^2}} = \sum_{n=0}^{\infty} P_n(\cos\theta)t^n \tag{1}$$

That leads to the following expression for $P_n(\cos\theta)$:

$$P_n(\cos\theta) = \int \frac{dt}{t^{n+1}\sqrt{1-2t\cos\theta+t^2}} \tag{2}$$