1 Useful Backwards Recurrence Relations

$$P_n^m(x) = \frac{(n-m+1)(n-m+2)P_{n+1}^{m-1}(x) - (n+m-1)(n+m)P_{n-1}^{m-1}(x)}{(2n+1)\sqrt{1-x^2}} \tag{1}$$

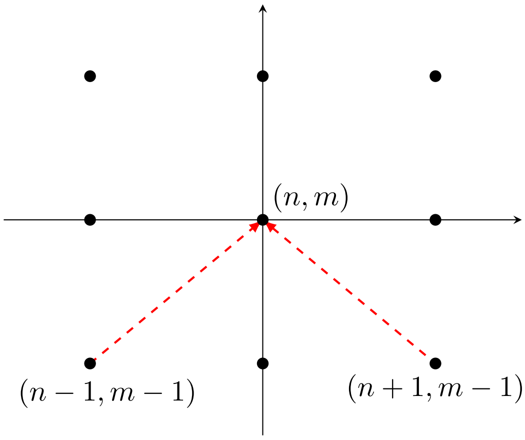

Figure 1: Legendre polynomial of degree n and order m recurrence relation defined by those at degree and order $(n\pm1,m-1)$ as (1).

$$P_n^m(x) = -\frac{\sqrt{1-x^2}}{2m}\left(P_{n-1}^{m+1}(x) + (n+m-1)(n+m)P_{n-1}^{m-1}(x)\right) \tag{2}$$

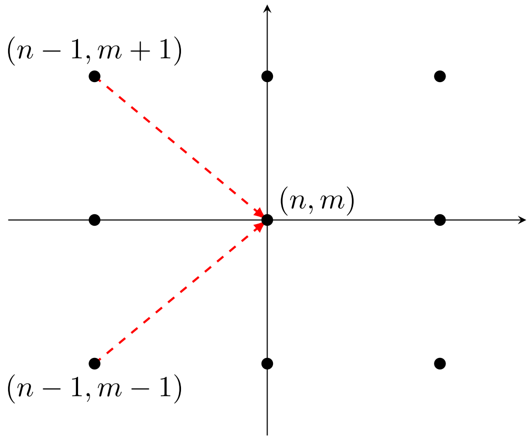

Figure 2: Legendre polynomial of degree n and order m recurrence relation defined by those at degree and order $(n-1,m\pm1)$ as (2).

$$2mxP_n^m(x) = -\sqrt{1-x^2}\left(P_n^{m+1}(x) + (n+m)(n-m+1)P_n^{m-1}(x)\right) \tag{3}$$

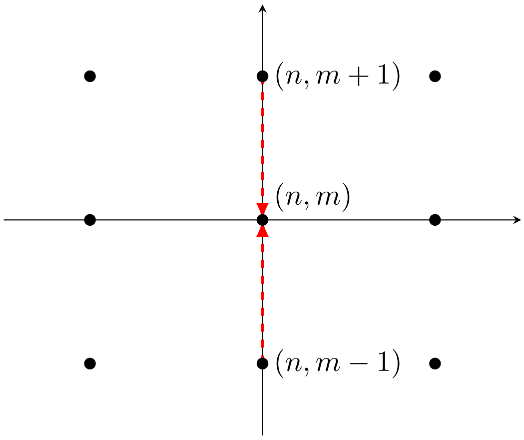

Figure 3: Legendre polynomial of degree n and order m recurrence relation defined by those at degree and order $(n, m \pm 1)$ as (3).

$$(n-m)xP_n^m(x) = \sqrt{1-x^2}P_n^{m+1}(x) + (n+m)P_{n+1}^m(x) \tag{4}$$

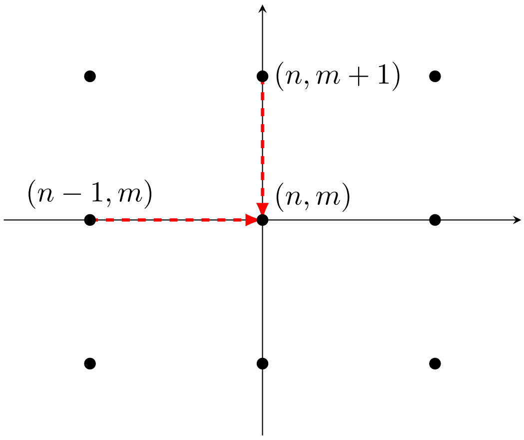

Figure 4: Legendre polynomial of degree n and order m recurrence relation defined by those at degree and order $(n-1, m)$ and $(n, m+1)$ as (4).