## Show the first 5 Legendre polynomials

In[23]:= `Do[Print[StringForm["P``(z) = `` ", n, LegendreP[n, z]]], {n, 0, 4}]`

$P_0(z) = 1$

$P_1(z) = z$

$P_2(z) = \frac{1}{2}\left(-1 + 3\,z^2\right)$

$P_3(z) = \frac{1}{2}\left(-3\,z + 5\,z^3\right)$

$P_4(z) = \frac{1}{8}\left(3 - 30\,z^2 + 35\,z^4\right)$

## Use Rodrigques' formula to calculate the first 5 polynomials.

$$P_l(z) = \frac{1}{2^l\,l!}\frac{d^l}{dz^l}(z^2 - 1)^l$$

In[32]:= `P_rodrigues[l_, z_] := FullSimplify[ 1/(2^l * l!) * D[(z^2 - 1)^l, {z, l}]]`

In[35]:= `Do[Print[StringForm["P``(z) = `` ", n, P_rodrigues[n, z]]], {n, 0, 4}]`

$P_0(z) = 1$

$P_1(z) = z$

$P_2(z) = \frac{1}{2}\left(-1 + 3\,z^2\right)$

$P_3(z) = \frac{1}{2}\,z\left(-3 + 5\,z^2\right)$

$P_4(z) = \frac{1}{8}\left(3 - 30\,z^2 + 35\,z^4\right)$