

Legendre functions have an important property that is, they are orthogonal on the interval $-1 \leq x \leq 1$:

$$\int_{-1}^1 P_m(x)P_n(x) dx = \frac{2}{2n + 1}\delta_{mn}$$

(where δ_{mn} denotes the *Kronecker delta*, equal to 1 if $m = n$ and to 0 otherwise).

We can verify this result using Scilab.

To work with Legendre Polynomials we use the Scilab function *legendre(n,m,x)*.

Which basically returns the value of the Associated Legendre Polynomial for a given value of m,n and x. However, since I only wanted Legendre Polynomials so I'll have to put m=0.

The following code returns the value of the integral, $\int P_m(x)*P_n(x)dx$,

```
//Legendre Polynomials Orthogonality Verification
clc;
n=input("Enter n:");
m=input("Enter m:");
a=integrate('legendre(m,0,x)*legendre(n,0,x)', 'x', -1,1,0.001);
mprintf('∫P%i(x)*P%f(x)dx= %g\n',m,n,a);
```

Output:

Enter n:1

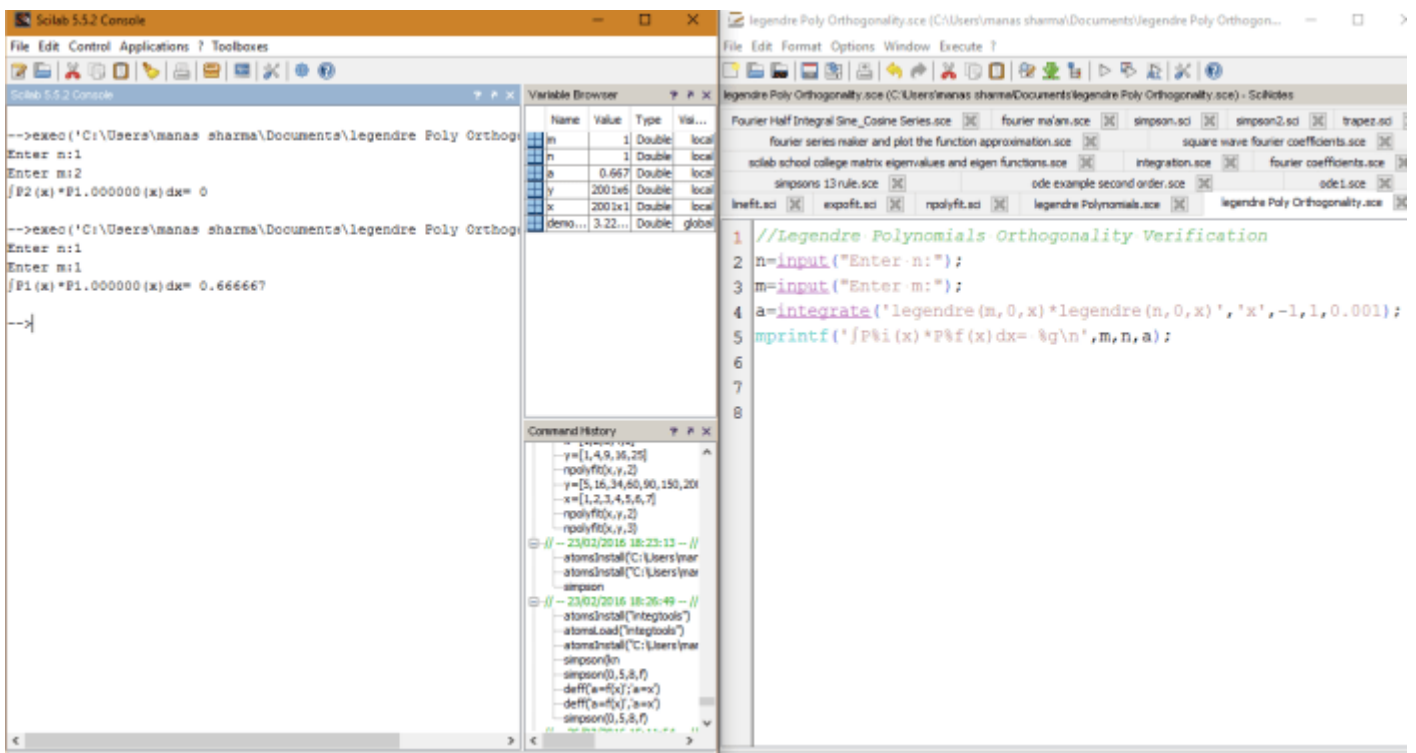
Enter m:1

∫P1(x)*P1.000000(x)dx= 0.666667

Enter n:5

Enter m:2

∫P2(x)*P5.000000(x)dx= 0





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