

GaussCollocationCoefficients

```
[s_Integer, doi_, a_Symbol, b_Symbol, c_Symbol] :=  
  
Module  
[ {f, g, ff, glist, B, A},  
  
Do[c[i] = N[(Root[LegendreP[s, #] &, i] + 1) / 2, doi]  
  // Simplify, {i, s}  
];  
  
ff = Collect[InterpolatingPolynomial  
  [Table[{c[i], f[i]}, {i, s}], x], f[_]];  
  
glist = Table[g[i] = Collect[ff, f[_],  
  Simplify[ $\int_0^{c[i]} \#1 \, dx$ ] &], {i, 1, s}];  
  
yy = Collect[ff, f[_], Simplify[ $\int_0^1 \#1 \, dx$ ] &];  
  
B = Table[b[i] =  $\partial_{f[i]}$  yy, {i, 1, s}];  
A = Table[a[i, j] = D[g[i], f[j]], {i, 1, s}, {j, 1, s}];  
  
{Array[c, s], B, A}  
  
]
```