**Expectation Values for the Harmonic Oscillator**

Expectation values to be computed:

Derivatives to be computed:

Each operator is expressed in term of the ladder operators, and .

Therefore, the following expectation values will be computed:

**Norm:**

Enforcing :

Enforcing :

Enforcing :

Index , and simplifying gives:

**Propagation of the TD-SE:**

Since, the basis functions do not depend on time explicitly

Project onto on both sides:

The solution is:

or: