

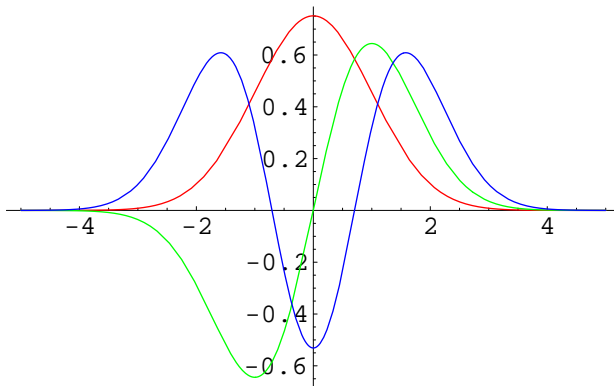
## Oscilador armonico

(\* Definicion de las Funciones de Onda \*)

$$\text{phi}[n_, x_] := \sqrt{\frac{1}{\sqrt{\text{Pi}} * 2^n * n!}} * \text{Exp}\left[\frac{-x^2}{2}\right] * \text{HermiteH}[n, x]$$

(\* Grafico de las funciones \*)

```
Plot[ {phi[0, x], phi[1, x], phi[2, x]}, {x, -5, 5},
      PlotStyle -> {RGBColor[1, 0, 0], RGBColor[0, 1, 0], RGBColor[0, 0, 1]} ];
```



(\* Chequeo de Normalizacion \*)

```
m = 6;
NIntegrate[ phi[m, x]^2, {x, -5, 5}]
0.999977
```

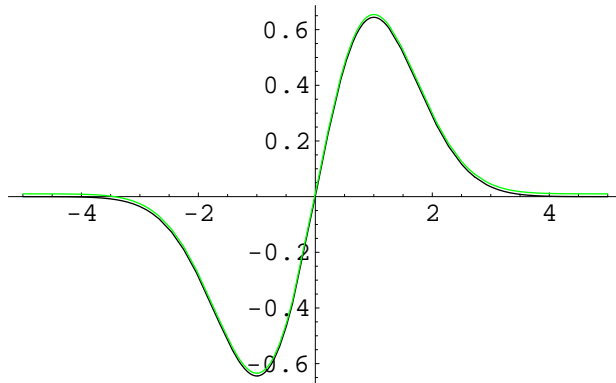
(\* Operadores de Creacion \*)

```
dx[n_, x_] := Derivative[0, 1][phi][n, x]
a†[n_, x_] := 1/Sqrt[2] * (-dx[n, x] + x*phi[n, x])
```

```
(* Comparacion de las funciones generadas
por operador de creacion, con las funciones analiticas *)
```

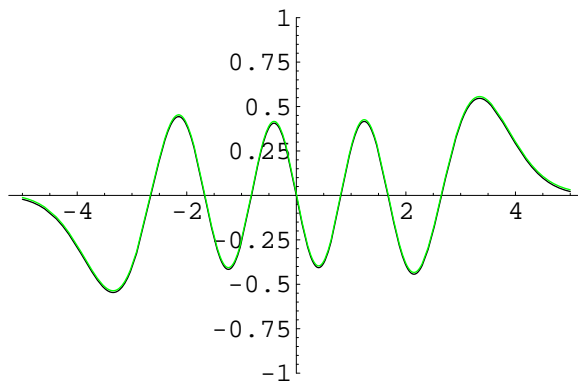
```
(* chequeo para n=1 *)
```

```
 $\epsilon = 0.01;$ 
Plot[{phi[1, x], a†[0, x] +  $\epsilon$ }, {x, -5, 5},
PlotStyle -> {RGBColor[0, 0, 0], RGBColor[0, 1, 0]}];
```



```
(* chequeo general *)
```

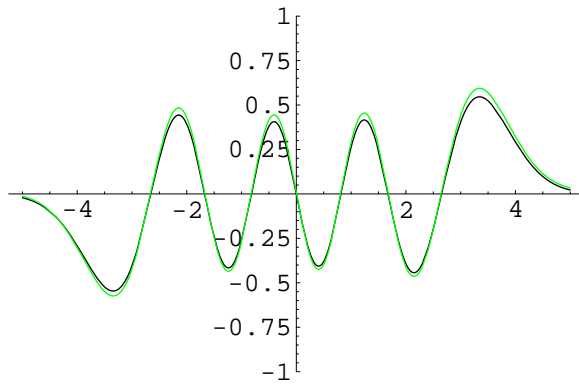
```
m = 7;
Plot[{phi[m, x], 1/Sqrt[m] * (a†[m-1, x] +  $\epsilon$ )},
{x, -5, 5}, PlotStyle -> {RGBColor[0, 0, 0], RGBColor[0, 1, 0]},
PlotRange -> {-1, 1}];
```



```
(* Operadores de Aniquilacion *)
```

```
a[n_, x_] := 1/Sqrt[2] * (dx[n, x] + x*phi[n, x])
```

```
m = 7;  
Plot[{phi[m, x], 1/Sqrt[m] * (a[m+1, x] + ε)},  
  {x, -5, 5}, PlotStyle -> {RGBColor[0, 0, 0], RGBColor[0, 1, 0]},  
  PlotRange -> {-1, 1}];
```



```
HTMLSave["creationmath.html", "creation.nb"];
```