Tarea 2

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In[1]:=
```
<< qmDS`
```

Problema 1

```
(* c) *)
```

In[2]:=
```
MatrixForm[Sx = ħ/2 * PauliMatrix[1]]
MatrixForm[Sy = ħ/2 * PauliMatrix[2]]
```

Out[2]//MatrixForm=

$$\begin{pmatrix} 0 & \frac{\hbar}{2} \\ \frac{\hbar}{2} & 0 \end{pmatrix}$$

Out[3]//MatrixForm=

$$\begin{pmatrix} 0 & -\frac{i\,\hbar}{2} \\ \frac{i\,\hbar}{2} & 0 \end{pmatrix}$$

In[4]:=
```
Sn = {Sqrt[3]/2, I/2}
```

Out[4]=
$$\left\{\frac{\sqrt{3}}{2}, \frac{i}{2}\right\}$$

In[11]:=
```
sxp = 1/Sqrt[2] * {1, 1}
sym = 1/Sqrt[2] * {1, -I}
(* Probabilidad para +ħ/2 en x *)
Abs[Conjugate[sxp].Sn]^2
(* Probabilidad para -ħ/2 en y *)
Abs[Conjugate[sym].Sn]^2 // N
```

Out[11]= $\left\{\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right\}$

Out[12]= $\left\{\frac{1}{\sqrt{2}}, -\frac{i}{\sqrt{2}}\right\}$

Out[13]= $\frac{1}{2}$

Out[14]= 0.0669873

Problema 3

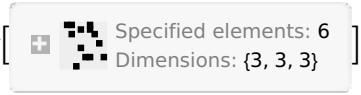
In[15]:=
```
(* Calculamos los conmutadores *)
MatrixForm[Sx = ħ/2 * PauliMatrix[1]]
MatrixForm[Sy = ħ/2 * PauliMatrix[2]]
MatrixForm[Sz = ħ/2 * PauliMatrix[3]]
```

Out[15]//MatrixForm=
$$\begin{pmatrix} 0 & \frac{\hbar}{2} \\ \frac{\hbar}{2} & 0 \end{pmatrix}$$

Out[16]//MatrixForm=
$$\begin{pmatrix} 0 & -\frac{i\hbar}{2} \\ \frac{i\hbar}{2} & 0 \end{pmatrix}$$

Out[17]//MatrixForm=
$$\begin{pmatrix} \frac{\hbar}{2} & 0 \\ 0 & -\frac{\hbar}{2} \end{pmatrix}$$

In[18]:=
```
SparseArray[LVT3 = LeviCivitaTensor[3]]
```

Out[18]=
```
SparseArray[ 
Specified elements: 6
Dimensions: {3, 3, 3} ]
```

In[19]:=
```
2 * I * LVT3[[1, 3, 2]] * PauliMatrix[2] * (ħ^2/4) (* [Sx,Sz] *)
```

Out[19]=
$$\left\{\left\{0, -\frac{\hbar^2}{2}\right\}, \left\{\frac{\hbar^2}{2}, 0\right\}\right\}$$

In[20]:=
```
2 * I * LVT3[[2, 3, 1]] * PauliMatrix[1] * (ħ^2/4) (* [Sx,Sz] *)
```

Out[20]=
$$\left\{\left\{0, \frac{i\,\hbar^2}{2}\right\}, \left\{\frac{i\,\hbar^2}{2}, 0\right\}\right\}$$

Problema 4

In[21]:=
```
(* Operadores Escalera *)
MatrixForm[Sp = {{0, 1}, {0, 0}}]
MatrixForm[Sm = {{0, 0}, {1, 0}}]
```

Out[21]//MatrixForm=
$$\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$$

Out[22]//MatrixForm=
$$\begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}$$

In[23]:=
```
MatrixForm[syp = 1/Sqrt[2] * {1, I}]
MatrixForm[sym = 1/Sqrt[2] * {1, -I}]
```

Out[23]//MatrixForm=
$$\begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{i}{\sqrt{2}} \end{pmatrix}$$

Out[24]//MatrixForm=
$$\begin{pmatrix} \frac{1}{\sqrt{2}} \\ -\frac{i}{\sqrt{2}} \end{pmatrix}$$

In[25]:=
```
(* Operaciones *)
MatrixForm[Sp.syp]
MatrixForm[Sp.sym]
MatrixForm[Sm.syp]
MatrixForm[Sm.sym]
```

Out[25]//MatrixForm=

$$\begin{pmatrix} \frac{i}{\sqrt{2}} \\ 0 \end{pmatrix}$$

Out[26]//MatrixForm=

$$\begin{pmatrix} -\frac{i}{\sqrt{2}} \\ 0 \end{pmatrix}$$

Out[27]//MatrixForm=

$$\begin{pmatrix} 0 \\ \frac{1}{\sqrt{2}} \end{pmatrix}$$

Out[28]//MatrixForm=

$$\begin{pmatrix} 0 \\ \frac{1}{\sqrt{2}} \end{pmatrix}$$