In[1]:=
```
Psif := Psi[x, y, z]
```

In[2]:=
```
r[x_, y_, z_] = Sqrt[x^2 + y^2 + z^2]
```

Out[2]=
$$\sqrt{x^2 + y^2 + z^2}$$

In[3]:=
```
eqn = -1/2 * Laplacian[Psif, {x, y, z}] - 1/r[x, y, z] * Psif == 0
```

Out[3]=
$$-\frac{\text{Psi}[x, y, z]}{\sqrt{x^2 + y^2 + z^2}} + \frac{1}{2}\left(-\text{Psi}^{(0,0,2)}[x, y, z] - \text{Psi}^{(0,2,0)}[x, y, z] - \text{Psi}^{(2,0,0)}[x, y, z]\right) == 0$$

In[4]:=
```
sol[x_, y_, z_] := BesselJ[0, 2 * Sqrt[x + r[x, y, z]]]
```

In[5]:=
```
FullSimplify[eqn /. Psi → ({x, y, z} ↦ sol[x, y, z])]
```

Out[5]=
```
True
```