

In[ ]:= **SphericalHarmonicY[0, 0, θ, ϕ]**

Out[ ]:=

$$\frac{1}{2\sqrt{\pi}}$$

In[ ]:= **f[n\_] := Table[SphericalHarmonicY[n, m, θ, ϕ], {m, -n, n}]**

In[ ]:= **f[1]**

Out[ ]:=

$$\left\{ \frac{1}{2} \sqrt{\frac{3}{2\pi}} e^{-i\phi} \sin(\theta), \frac{1}{2} \sqrt{\frac{3}{\pi}} \cos(\theta), -\frac{1}{2} \sqrt{\frac{3}{2\pi}} e^{i\phi} \sin(\theta) \right\}$$

In[ ]:= **f[2]**

Out[ ]:=

$$\left\{ \frac{1}{4} \sqrt{\frac{15}{2\pi}} e^{-2i\phi} \sin^2(\theta), \frac{1}{2} \sqrt{\frac{15}{2\pi}} e^{-i\phi} \sin(\theta) \cos(\theta), \right. \\ \left. \frac{1}{4} \sqrt{\frac{5}{\pi}} (3 \cos^2(\theta) - 1), -\frac{1}{2} \sqrt{\frac{15}{2\pi}} e^{i\phi} \sin(\theta) \cos(\theta), \frac{1}{4} \sqrt{\frac{15}{2\pi}} e^{2i\phi} \sin^2(\theta) \right\}$$

In[ ]:= **f[3]**

Out[ ]:=

$$\left\{ \frac{1}{8} \sqrt{\frac{35}{\pi}} e^{-3i\phi} \sin^3(\theta), \frac{1}{4} \sqrt{\frac{105}{2\pi}} e^{-2i\phi} \sin^2(\theta) \cos(\theta), \frac{1}{8} \sqrt{\frac{21}{\pi}} e^{-i\phi} \sin(\theta) (5 \cos^2(\theta) - 1), \frac{1}{4} \sqrt{\frac{7}{\pi}} (5 \cos^3(\theta) - 3 \cos(\theta)), \right. \\ \left. -\frac{1}{8} \sqrt{\frac{21}{\pi}} e^{i\phi} \sin(\theta) (5 \cos^2(\theta) - 1), \frac{1}{4} \sqrt{\frac{105}{2\pi}} e^{2i\phi} \sin^2(\theta) \cos(\theta), -\frac{1}{8} \sqrt{\frac{35}{\pi}} e^{3i\phi} \sin^3(\theta) \right\}$$

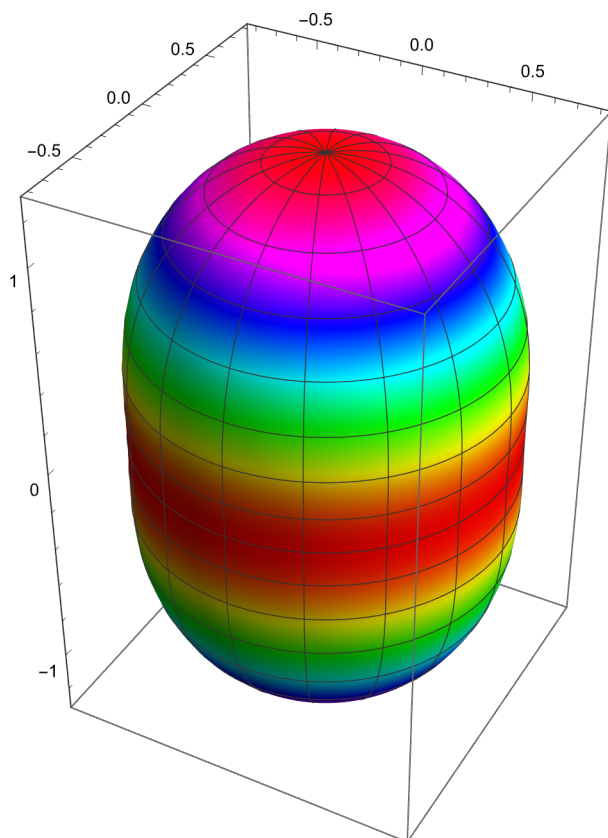
In[ ]:= **r[m\_, n\_, θ\_, ϕ\_] = 1 + 1/2 Re[SphericalHarmonicY[n, m, θ, ϕ]]**

Out[ ]:=

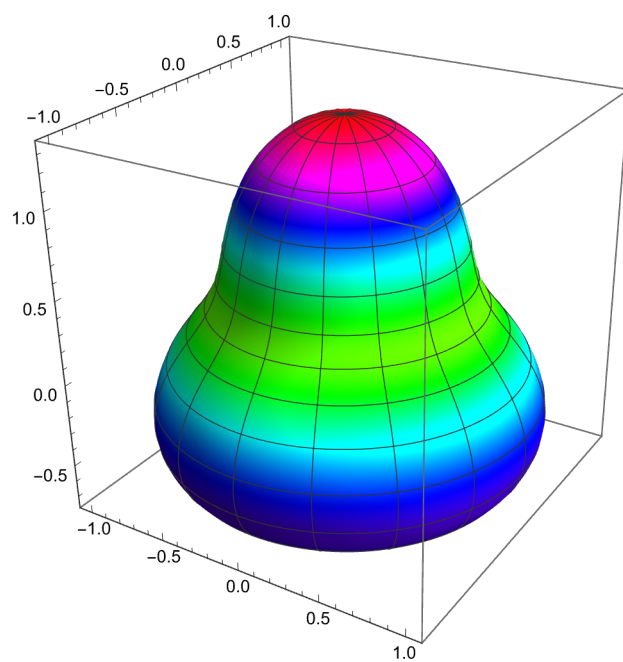
$$\frac{1}{2} \operatorname{Re}(Y_n^m(\theta, \phi)) + 1$$

In[ ]:= **showMode[m\_, n\_] := SphericalPlot3D[r[m, n, θ, ϕ], {θ, 0, Pi}, {ϕ, 0, 2 Pi},  
ColorFunction → Function[{x, y, z, θ, ϕ, r}, Hue[r]], PlotPoints → 128]**

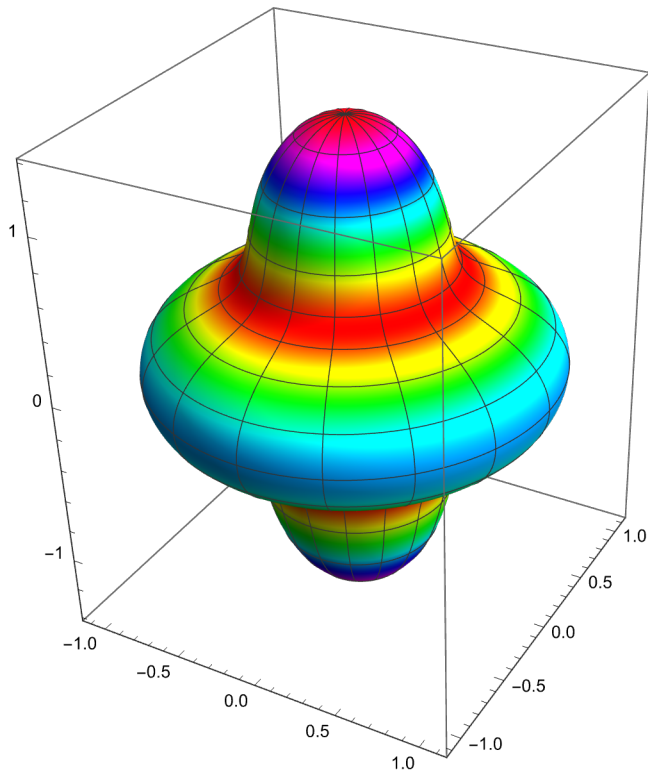
```
In[*]:= showMode[0, 2]
Out[*]=
```



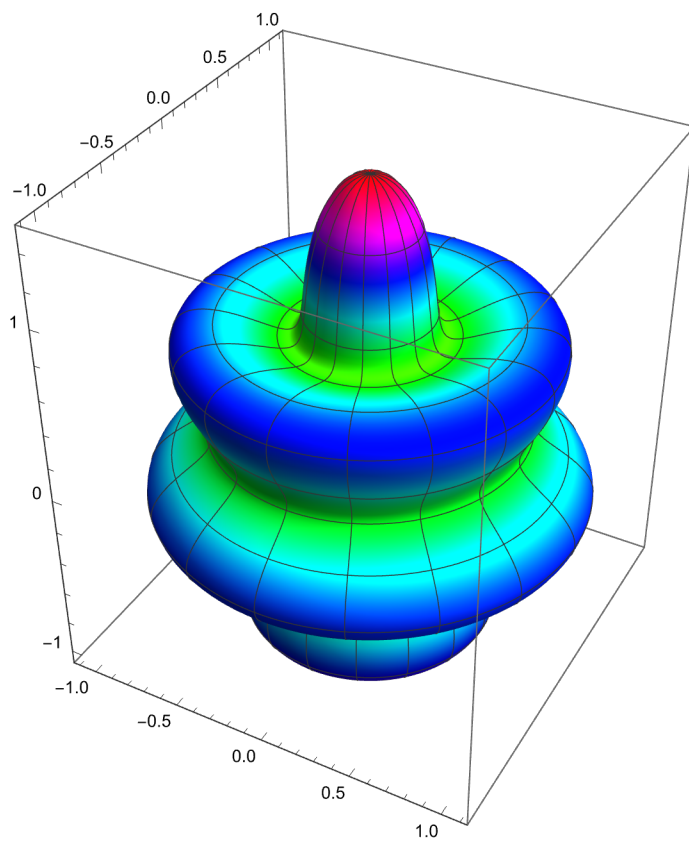
```
In[*]:= showMode[0, 3]
Out[*]=
```



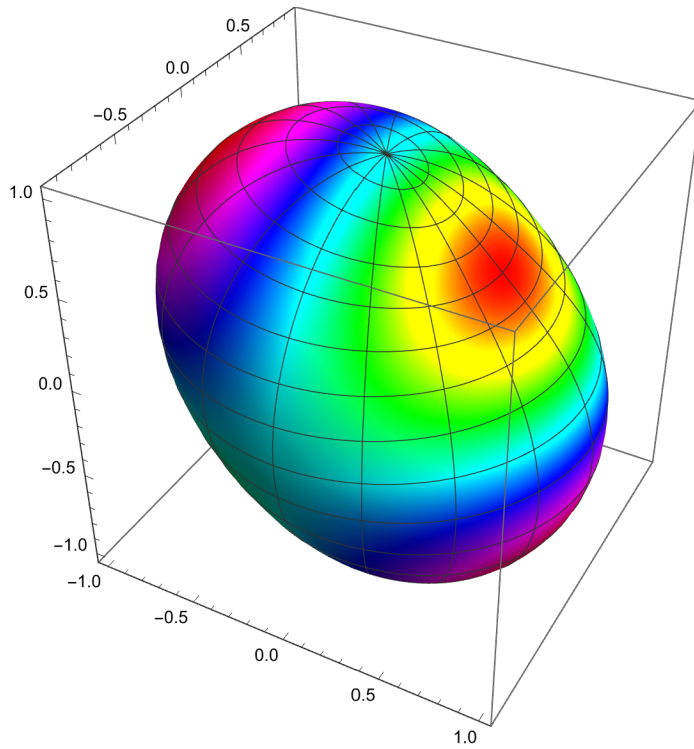
```
In[*]:= showMode[0, 4]  
Out[*]=
```



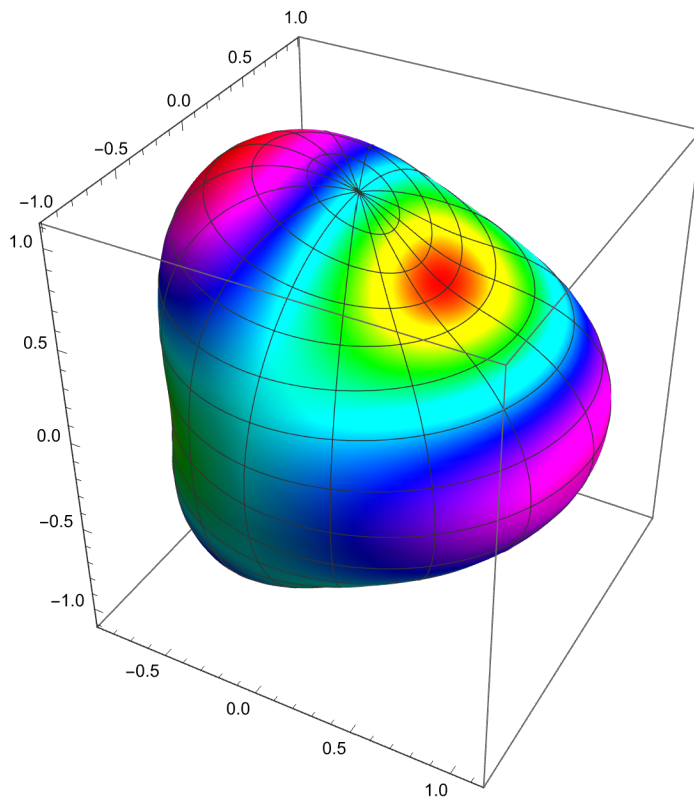
```
In[ ]:= showMode[0, 7]  
Out[ ]:=
```



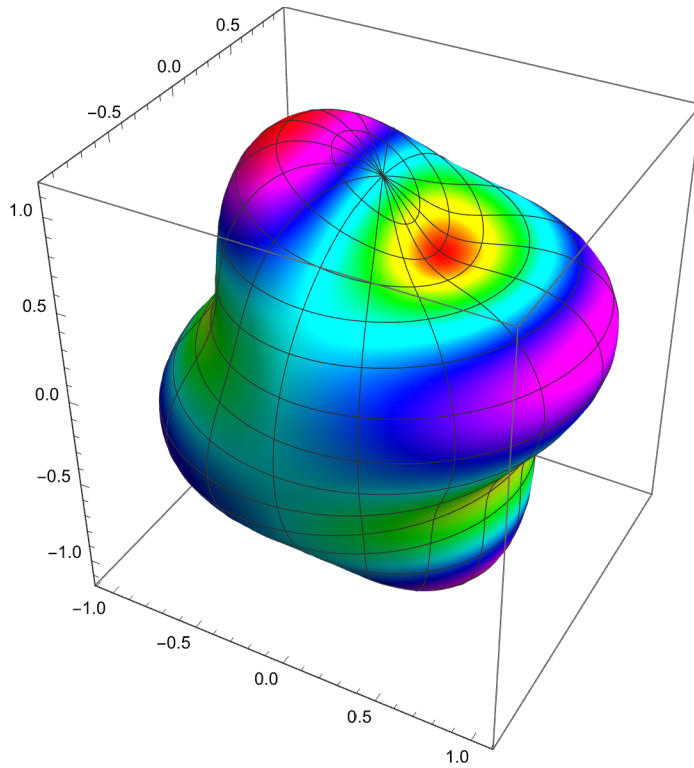
```
In[*]:= showMode[1, 2]  
Out[*]=
```



```
In[*]:= showMode[1, 3]  
Out[*]=
```



```
In[ ]:= showMode[1, 4]  
Out[ ]:=
```



```
In[ ]:= showMode[4, 7]  
Out[ ]:=
```

