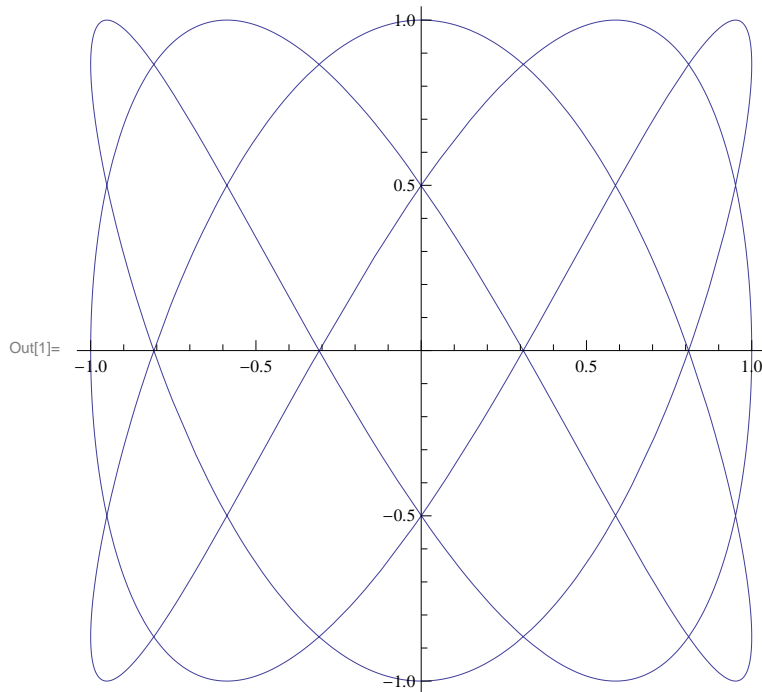


In[1]:= ParametricPlot[{Cos[3 t], Sin[5 t]}, {t, 0, 2 Pi}]



In[2]:= D[{Cos[3 t], Sin[5 t]}, t]

Out[2]= {-3 Sin[3 t], 5 Cos[5 t]}

In[3]:= {-3 Sin[3 t], 5 Cos[5 t]} . {-3 Sin[3 t], 5 Cos[5 t]}

Out[3]= 25 Cos[5 t]^2 + 9 Sin[3 t]^2

In[4]:= Integrate[ $\sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2}$ , {t, 0, 2 Pi}]

Out[4]=  $\int_0^{2\pi} \sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2} dt$

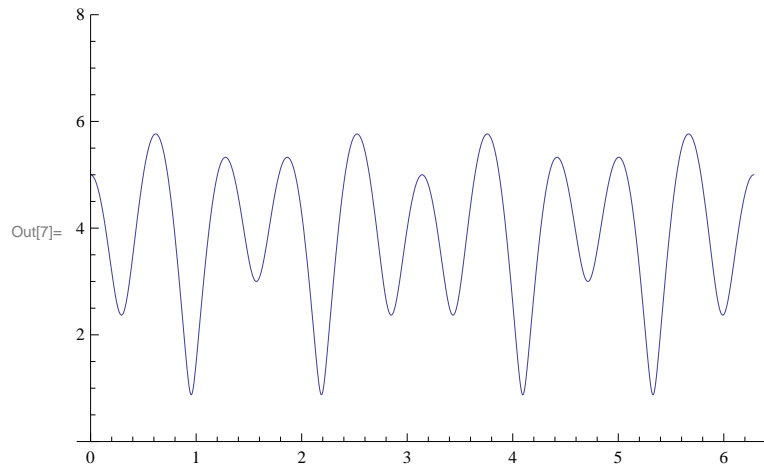
In[5]:= Integrate[ $\sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2}$ , t]

Out[5]=  $\int \sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2} dt$

In[6]:= NIntegrate[ $\sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2}$ , {t, 0, 2 Pi}]

Out[6]= 24.603

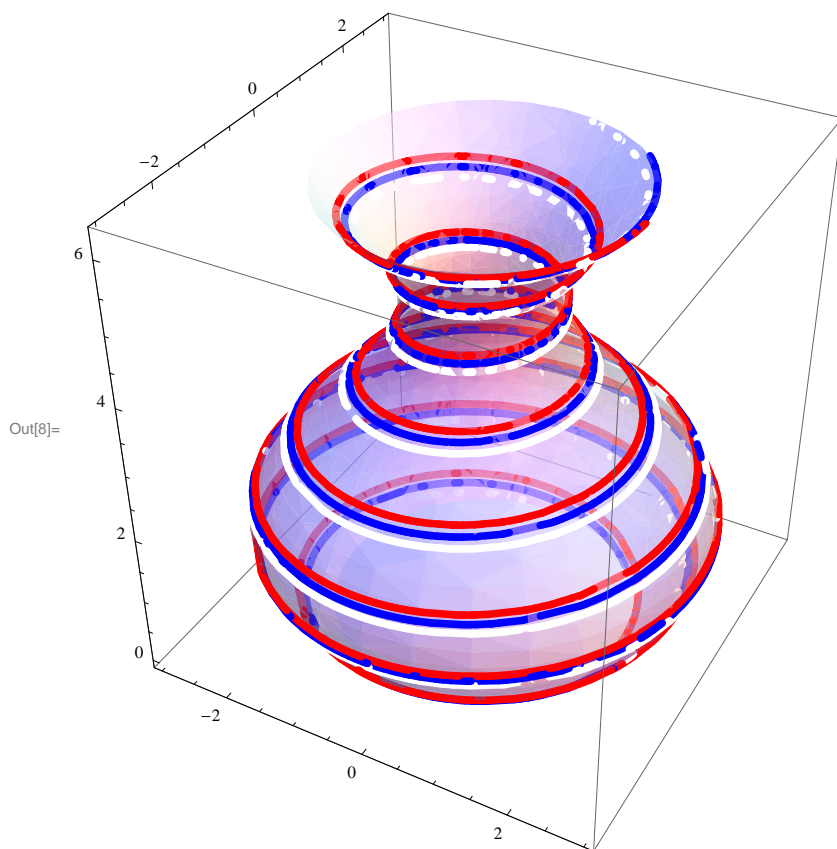
```
In[7]:= Plot[ $\sqrt{25 \text{Cos}[5 t]^2 + 9 \text{Sin}[3 t]^2}$ , {t, 0, 2 Pi}, PlotRange -> {0, 8}]
```



```

In[8]:= decovase1 = Show[
  ParametricPlot3D[{(2 + Sin[z]) Cos[θ], (2 + Sin[z]) Sin[θ], z},
    {z, 0, 2 Pi}, {θ, 0, 2 Pi}, PlotStyle → {Opacity[0.5]}, Mesh → False],
  ParametricPlot3D[{r Cos[θ], r Sin[θ], 0}, {r, 0, 2}, {θ, 0, 2 Pi},
    PlotStyle → {Opacity[0.5]}, Mesh → False],
  ParametricPlot3D[{(2 + Sin[ $\frac{\theta}{8}$ ]) Cos[θ], (2 + Sin[ $\frac{\theta}{8}$ ]) Sin[θ],  $\frac{\theta}{8}$ },
    {θ, 0, 16 Pi}, PlotStyle → {Thickness[0.01], Red}],
  ParametricPlot3D[{(2 + Sin[ $\frac{\theta}{8}$ ]) Cos[ $\theta + \frac{\pi}{4}$ ], (2 + Sin[ $\frac{\theta}{8}$ ]) Sin[ $\theta + \frac{\pi}{4}$ ],  $\frac{\theta}{8}$ },
    {θ, 0, 16 Pi}, PlotStyle → {Thickness[0.01], Blue}],
  ParametricPlot3D[{(2 + Sin[ $\frac{\theta}{8}$ ]) Cos[ $\theta + \frac{\pi}{2}$ ], (2 + Sin[ $\frac{\theta}{8}$ ]) Sin[ $\theta + \frac{\pi}{2}$ ],  $\frac{\theta}{8}$ },
    {θ, 0, 16 Pi}, PlotStyle → {Thickness[0.01], White}],
  ImageSize → 800]; Show[decovase1, ImageSize → 400]

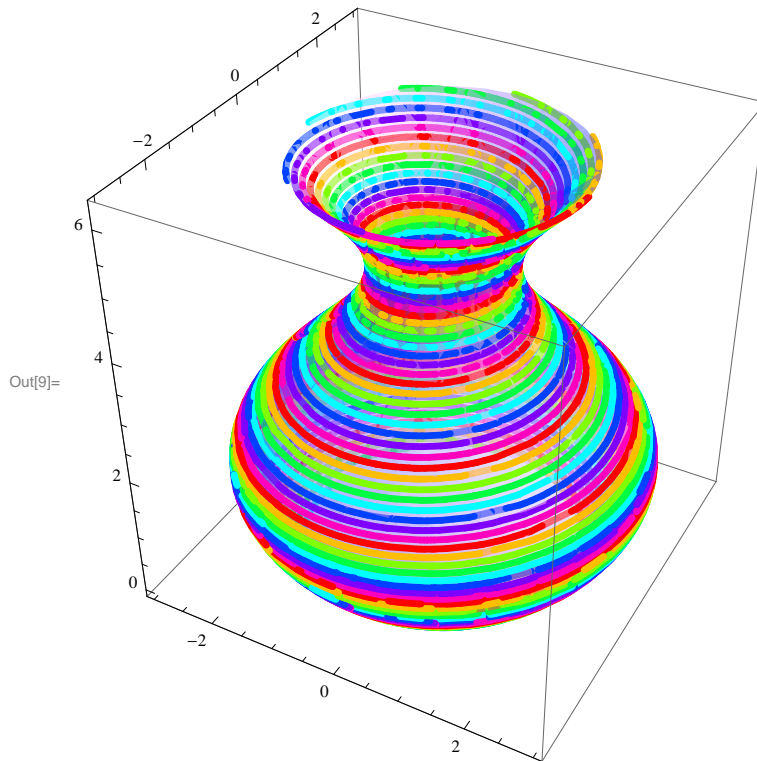
```



```

In[9]:= Show[
  ParametricPlot3D[{(2 + Sin[z]) Cos[θ], (2 + Sin[z]) Sin[θ], z},
    {z, 0, 2 Pi}, {θ, 0, 2 Pi}, PlotStyle → {Opacity[0.5]}, Mesh → False],
  ParametricPlot3D[{r Cos[θ], r Sin[θ], 0}, {r, 0, 2},
    {θ, 0, 2 Pi}, PlotStyle → {Opacity[0.5]}, Mesh → False],
  Table[ParametricPlot3D[{{(2 + Sin[ $\frac{\theta}{8}$ ]) Cos[θ + sh], (2 + Sin[ $\frac{\theta}{8}$ ]) Sin[θ + sh],  $\frac{\theta}{8}$ },
    {θ, 0, 16 Pi}, PlotStyle → {Thickness[0.01], Hue[ $\frac{sh}{2 Pi}$ ]}}], {sh,  $\frac{Pi}{4}$ , 2 Pi,  $\frac{Pi}{4}$ }]

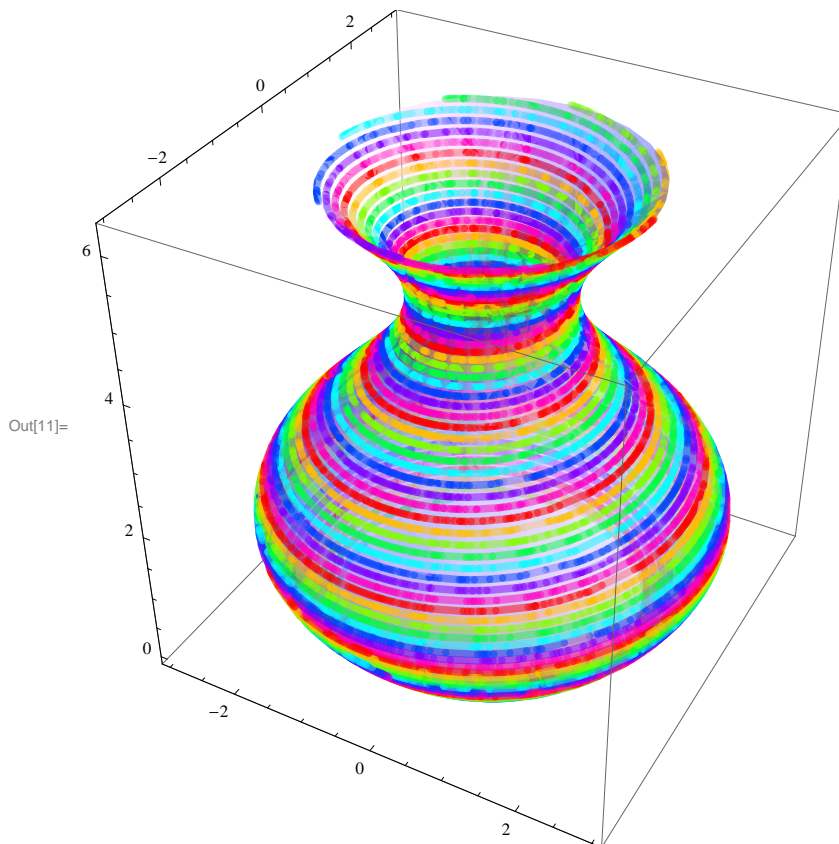
```



```

In[10]:= decovase = Show[
  ParametricPlot3D[{(2 + Sin[z]) Cos[θ], (2 + Sin[z]) Sin[θ], z},
    {z, 0, 2 Pi}, {θ, 0, 2 Pi}, PlotStyle → {Opacity[0.5]}, Mesh → False],
  ParametricPlot3D[{r Cos[θ], r Sin[θ], 0}, {r, 0, 2}, {θ, 0, 2 Pi},
    PlotStyle → {Opacity[0.5]}, Mesh → False],
  Table[ParametricPlot3D[{{(2 + Sin[ $\frac{\theta}{8}$ ]) Cos[θ + sh], (2 + Sin[ $\frac{\theta}{8}$ ]) Sin[θ + sh],  $\frac{\theta}{8}$ },
    {θ, 0, 16 Pi}, PlotStyle → {Thickness[0.01], Hue[ $\frac{sh}{2 Pi}$ ], Opacity[0.5]}],
    {sh,  $\frac{Pi}{4}$ , 2 Pi,  $\frac{Pi}{4}$ }], ImageSize → 800];
Show[decovase, ImageSize → 400]

```



```
In[12]:= SetDirectory[NotebookDirectory[]]
```

```
Out[12]= C:\Dropbox\Work\myweb\Courses\225_201530
```

```
In[13]:= Export["decovase.gif", decovase]
```

```
Out[13]= decovase.gif
```

```
In[14]:= Export["decovase.png", decovase]
```

```
Out[14]= decovase.png
```

```
In[15]= Export["decovase1.gif", decovase1]
```

```
Out[15]= decovase1.gif
```

```
In[16]= Export["decovase1.png", decovase1]
```

```
Out[16]= decovase1.png
```