GRAFICACIÓN DE SUPERFICIES

Uno de los comandos de graficación tridimensional es Plot3D

```
Plot3D[x^2 / 4 + y^2 / 9, {x, -7, 7}, {y, -7, 7},
 Boxed → False, PlotLabel → "Paraboloide Eliptico"]
```

Es frecuente que el comando anterior no permita una buena visualización de una superficie. En esos casos existe otra posibilidad : el comando ParametricPlot3D.

```
ParametricPlot3D[{x = 2 * v * Cos[u], y = 3 * v * Sin[u], z = v^2}, {u, 0, 2 Pi},
 {v, 0, 10}, Axes → None, Boxed → False, PlotLabel → "Paraboloide Eliptico"]
```

El comando ContourPlot sirve para generar el mapa de contorno de una superficie, su aspecto es muy importante en las interpretaciones.

```
ContourPlot[x^2 / 4 + y^2 / 9, {x, -7, 7}, {y, -7, 7}, PlotPoints -> 40]
```

```
Plot3D[Sqrt[1 - (x^2 / 4) - (y^2 / 9)], {x, -3, 3},
 {y, -3, 3}, Boxed → False, PlotLabel → "Elipsoide"]
```

El comando ParametricPlot3D exige el conocimiento de la así llamada : parametrización de la superficie.

```
ParametricPlot3D[{1 + 2 Cos[u] Sin[v], 3 Sin[u] Sin[v], -2 Cos[v]},
 {u, 0, 2 π}, {v, 0, π}, Boxed -> False, PlotLabel → "Elipsoide"]
```

```
ContourPlot[x^2 / 4 + y^2 / 9 - 1, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[Sqrt[x^2 / 4 + y^2 / 9], {x, -7, 7},
 {y, -7, 7}, Boxed → False, PlotLabel → "Cono Eliptico"]
```

Completa las indicaciones anteriores y las siguientes para que practiques con estos comandos.

```
ParametricPlot3D[{x = 2 * v * Cos[u], y = 3 * v * Sin[u], z = v}, {u, 0, 2 Pi},
 {v, -10, 10}, Axes → None, Boxed → True, PlotLabel → "Cono Eliptico"]
```

```
Plot3D[Sqrt[(x^2 / 4) + (y^2 / 9) - 1], {x, -10, 10}, {y, -10, 10},
 Boxed → False, PlotLabel → "Hiperboloide de una Hoja"]
```

```
ParametricPlot3D[{Cos[u] Cosh[v], 3 Sin[u] Cosh[v], 2 Sinh[v]}, {v, -2, 2},
 {u, 0, 2 π}, Boxed -> False, PlotLabel → "Hiperboloide de una hoja"]
```

```
ContourPlot[x^2 / 4 + y^2 / 9 - 1, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[Sqrt[1 + x^2 / 4 + y^2 / 9], {x, -7, 7}, {y, -7, 7},
 Boxed → False, PlotLabel → "Hiperboloide de dos hojas"]
```

Elabora un breve reporte de este laboratorio. Donde se incorpore un comando adicional, indica cuál es su función.

```
ParametricPlot3D[{{x = 2 * Sinh[u] * Cos[v], y = 2 * Sinh[u] * Sin[v], z = Cosh[u]},
   {x = 2 * Sinh[u] * Cos[v], y = 2 * Sinh[u] * Sin[v], z = -Cosh[u]}}, {v, 0, Pi},
 {u, -15, 15}, PlotRange → {-10, 10}, PlotLabel → "Hiperboloide de dos Hojas"]
```

```
ContourPlot3D[x^2 + y^2 - 1. z^2 == -1.,
 {x, -2, 2}, {y, -2, 2}, {z, -3, 3}, PlotPoints → 50]
```

```
ContourPlot[1 + x^2 / 4 + y^2 / 9, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[Sqrt[1 - (x^2) - (y^2)], {x, -1, 1},
 {y, -1, 1}, Boxed → False, PlotLabel → "Esfera"]
```

```
ParametricPlot3D[
 {{Cos[u] Sin[v], Sin[u] Sin[v], Cos[v]}, {Cos[u] Sin[v], Sin[u] Sin[v], Cos[v]}},
 {u, 0, 2 π}, {v, 0, π}, Boxed -> False, PlotLabel → "Esfera"]
```

```
ContourPlot3D[x^2 + y^2 + z^2 == 1,
 {x, -1, 1}, {y, -1, 1}, {z, -1, 1}, PlotPoints → 50]
```

```
ContourPlot[x^2 + y^2 - 4, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[y^2 / 9 - x^2 / 4, {x, -7, 7}, {y, -7, 7},
 PlotRange -> {0, 10}, PlotLabel → "Paraboloide Hiperbolico"]
```

```
ParametricPlot3D[{x = 2 * v * Sin[u], y = 3 * v * Cos[u], z = v^2 * Cos[2 u]},
 {u, 0, 2 Pi}, {v, 0, 10}, Boxed → True, PlotLabel → "Paraboloide Hiperbolico"]
```

```
ContourPlot[-x^2 / 4 + y^2 / 9, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[x^2 / 9 + y^2 - 1, {x, -3, 3}, {y, -1, 1},
 Boxed → False, PlotLabel → "Cilindro eliptico"]
```

```
ParametricPlot3D[{3 Cos[v], Sin[v], u}, {u, -3, 3},
 {v, 0, 2 π}, Boxed -> False, PlotLabel → "Cilindro Eliptico"]
```

```
ContourPlot[x^2 / 4 + y^2 / 9 - 1, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[-2 x - 3 y, {x, -5, 5}, {y, -5, 5}, Boxed → False, PlotLabel → "Plano"]
```

```
ParametricPlot3D[{x, y, z = -2 x - 3 y},
 {x, -10, 10}, {y, -10, 10}, PlotLabel → "Plano"]
```

```
ContourPlot[2 x + 3 y, {x, -10, 10}, {y, -10, 10}, PlotPoints → 40]
```

```
Plot3D[u^3 - 3 u (v^2), {u, -1.5, 1.5},
 {v, -1.5, 1.5}, Boxed → False, PlotLabel → "Silla de Montar"]
```

```
ParametricPlot3D[{u, v, u^3 - 3 u (v^2)}, {u, -1.5, 1.5},
 {v, -1.5, 1.5}, Boxed → False, PlotLabel → "Silla de Montar"]
```

```
ContourPlot[u^3 - 3 u (v^2), {u, -1.5, 1.5}, {v, -1.5, 1.5}, PlotPoints → 40]
```

```
Plot3D[Sqrt[1^2 - (2 - Sqrt[x^2 + y^2])^2], {x, -10, 10},
 {y, -10, 10}, Boxed → False, PlotLabel → "Toro"]
```

```
ParametricPlot3D[{(10 + 5 Cos[v]) * Cos[u], (10 + 5 Cos[v]) * Sin[u], 5 Sin[v]},
 {u, 0, 2 * Pi}, {v, 0, 2 * Pi}, PlotLabel → "Toro"]
```

```
ContourPlot[1^2 - (2 - Sqrt[x^2 + y^2])^2, {x, -10, 10}, {y, -20, 20}, PlotPoints → 40]
```