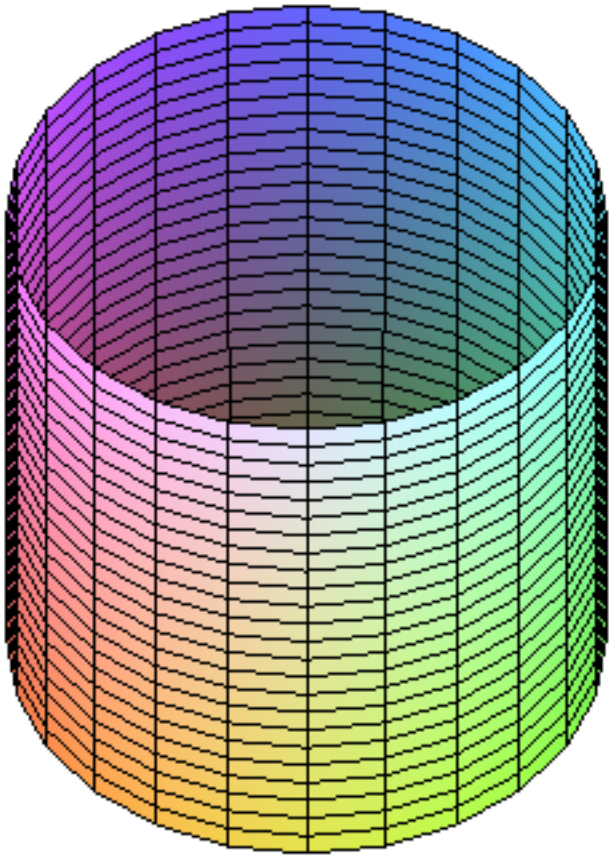
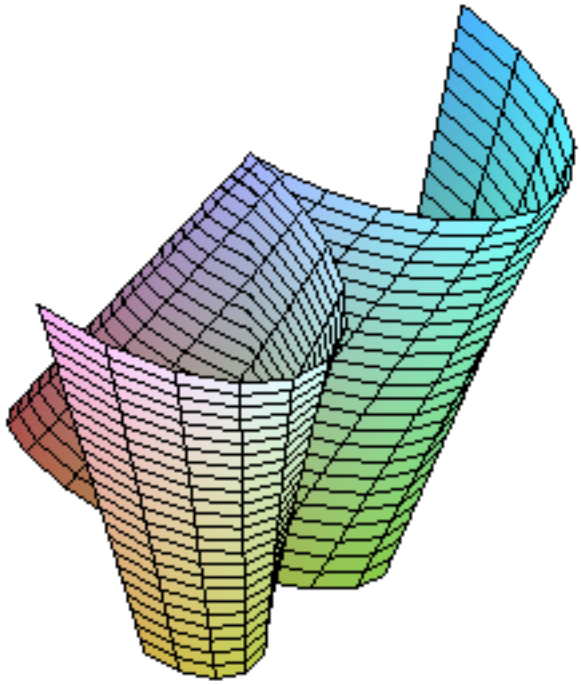
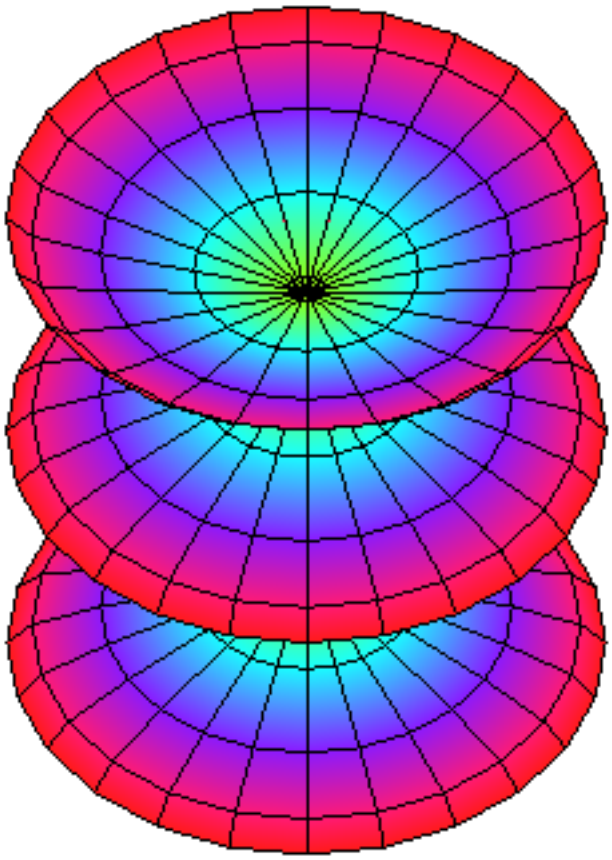
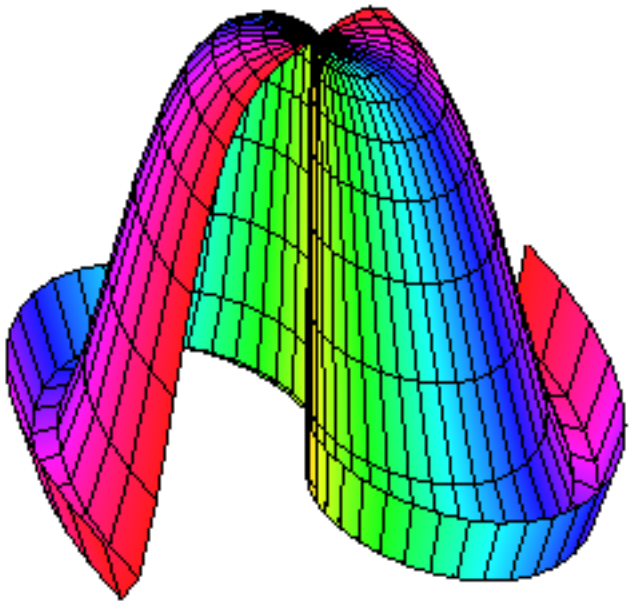
```
> restart;
> with(plots):
> cylinderplot(1,theta=0..2*Pi,z=-1..1);
  f := (5*cos(y)^2 -1)/3;
  cylinderplot(f, x=0..2*Pi,y=-Pi..Pi,style=PATCH, color = f);
  cylinderplot([z*theta,theta,cos(z^2)],theta=0..Pi,z=-2..2, color
  = theta);
```



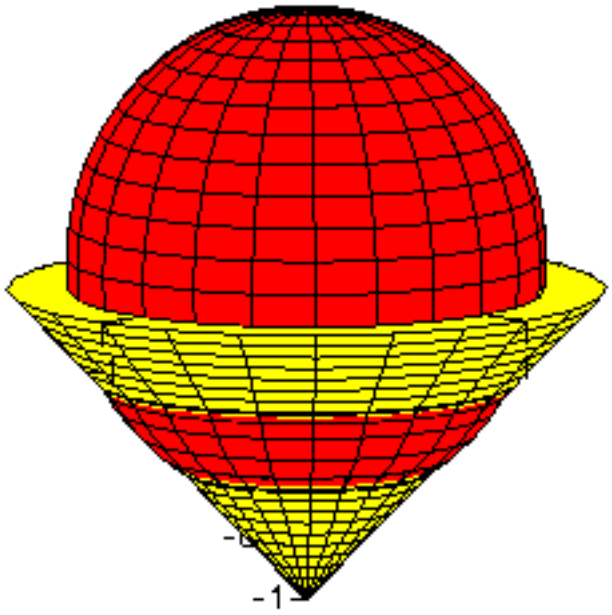


$$f := \frac{5}{3}\cos(y)^2 - \frac{1}{3}$$

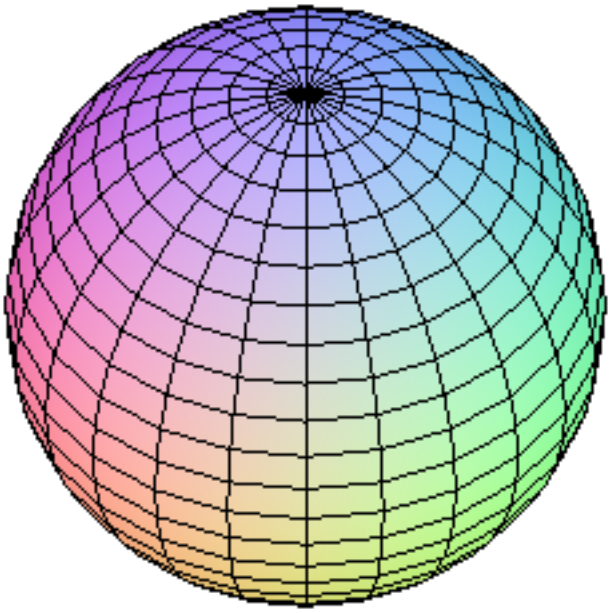


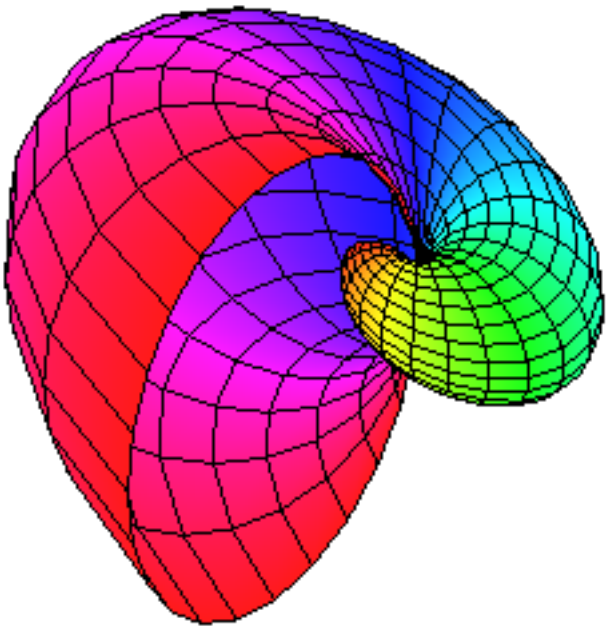


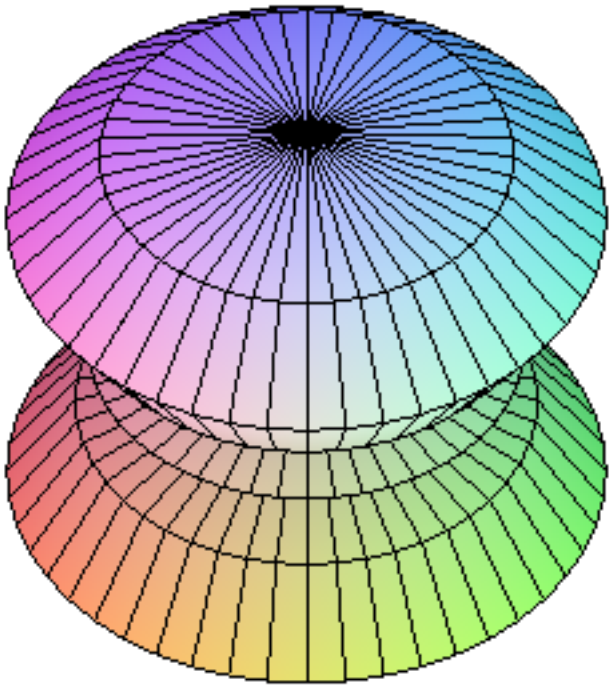
```
> with(plottools):
> icecream:=cone([0,0,-1],color=yellow), sphere([0,0,0.1],0.8,
  color=red):
> plots[display](icecream,style=patch,orientation=[128,76]);
```



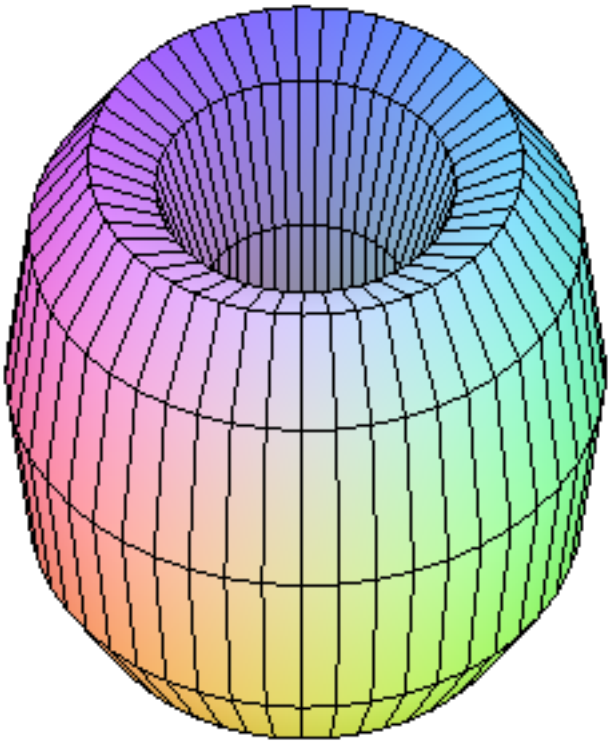

```
> sphereplot(1,theta=0..2*Pi,phi=0..Pi);
  sphereplot((1.3)^z * sin(theta),z=-1..2*Pi,theta=0..Pi,style=
  patch,color=z);
  sphereplot((5*cos(y)^2 -1)/2,x=0..Pi,y=-Pi..Pi,style=PATCH);
```

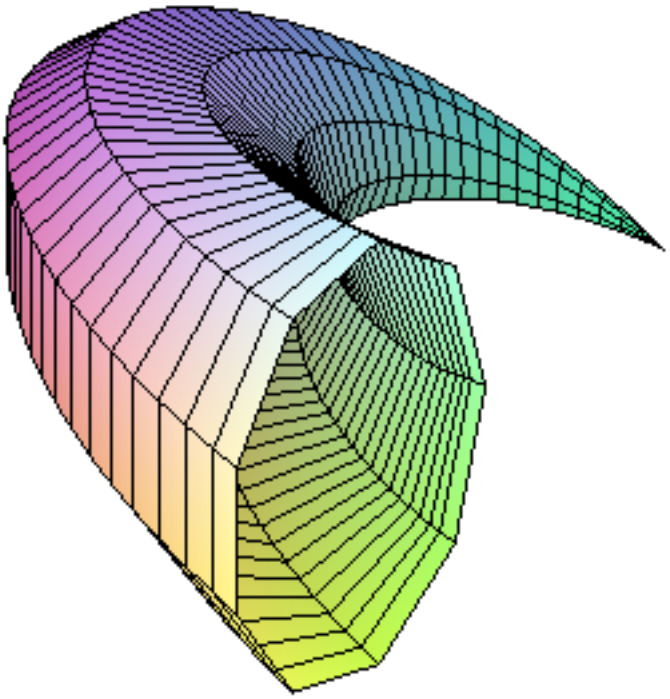


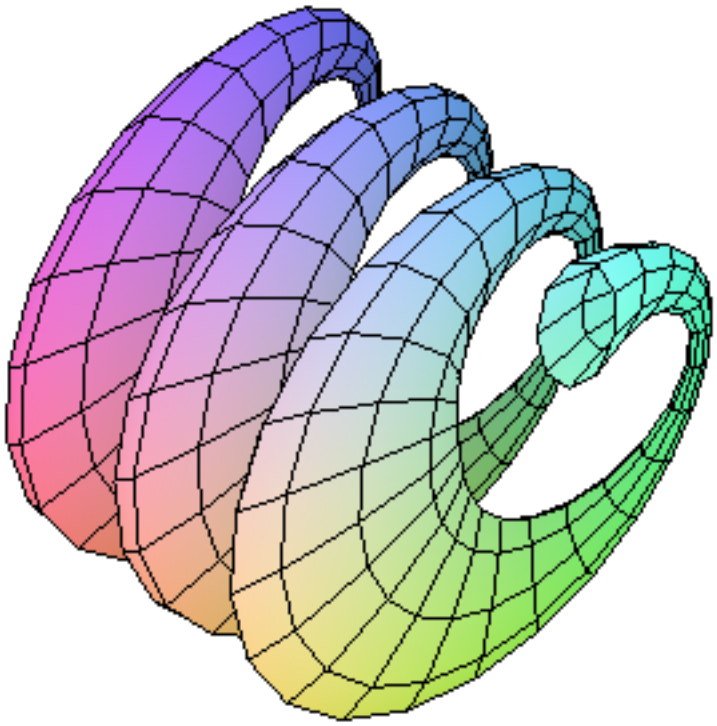


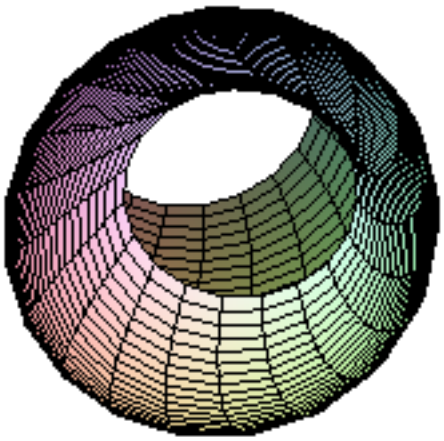


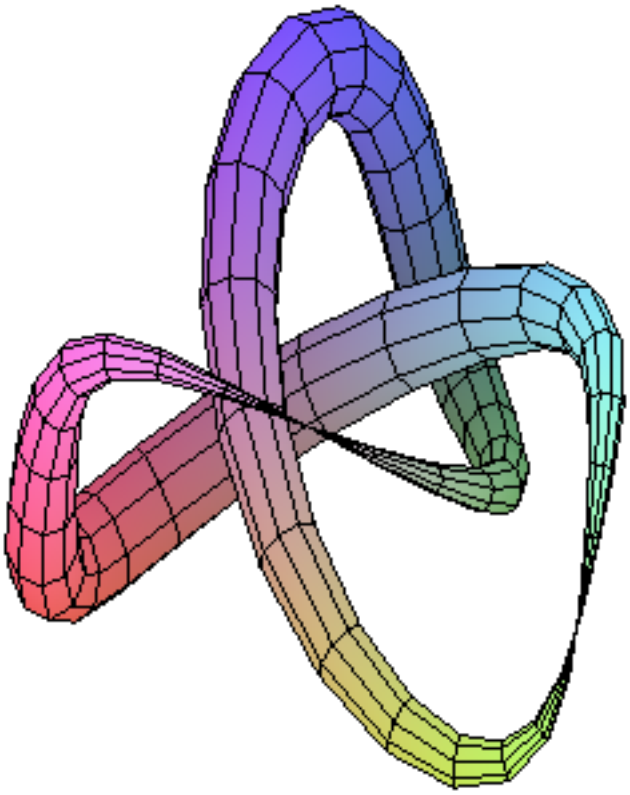
```
> tubeplot([cos(t),sin(t),0],t=0..2*Pi,radius=0.5);
  tubeplot([cos(t),sin(t),0,t=Pi..2*Pi,radius=0.25*(t-Pi)]);
  tubeplot([3*sin(t),t,3*cos(t)],t=-3*Pi..4*Pi,radius=1.2+sin(t),
  numpoints=80);
  tubeplot([sin(t),t,exp(t)],t=-1..1,radius=cos(t),tubepoints=20);
  tubeplot( [ -10*cos(t) - 2*cos(5*t) + 15*sin(2*t),
              -15*cos(2*t) + 10*sin(t) - 2*sin(5*t),
               10*cos(3*t) ], t= 0..2*Pi,radius=3*cos(t*Pi/3));
```



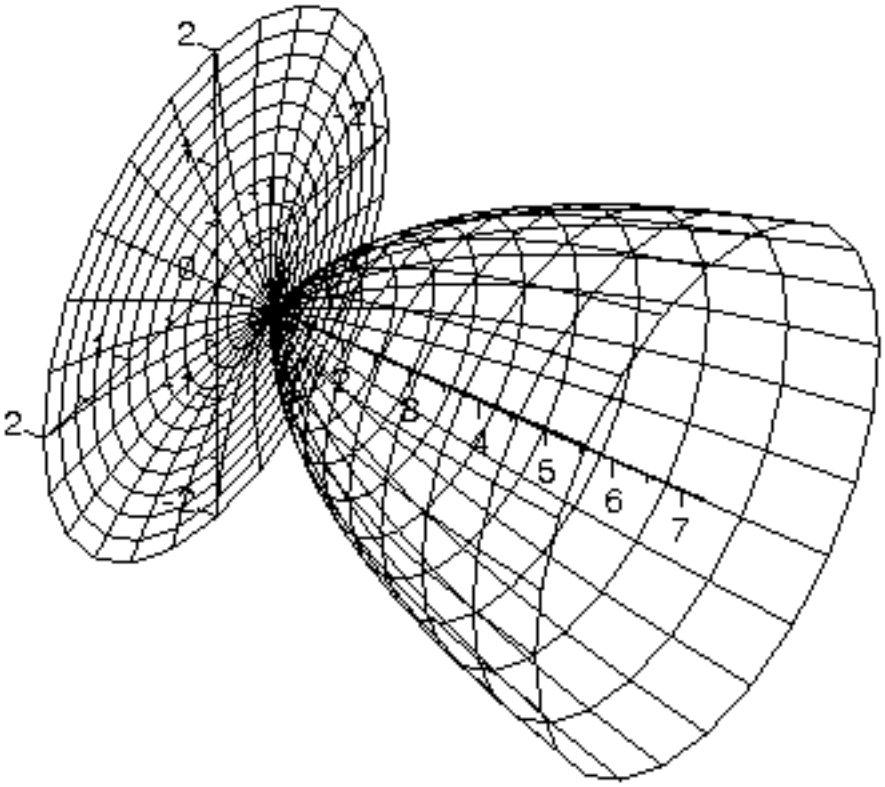




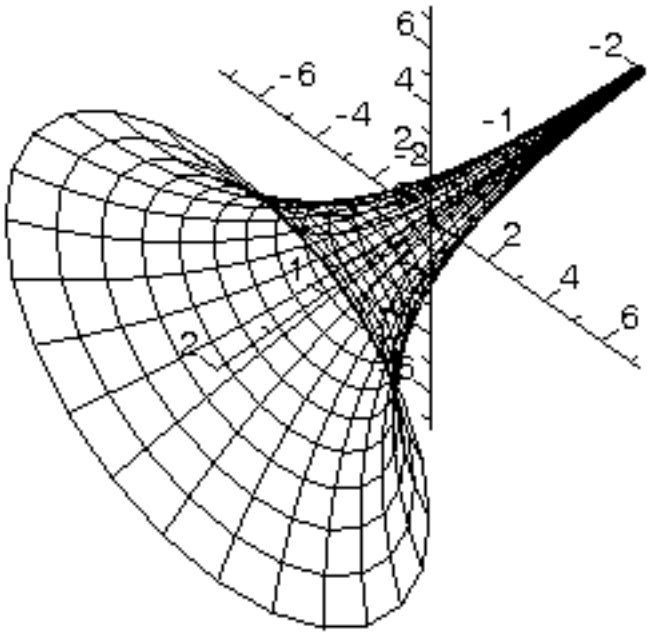




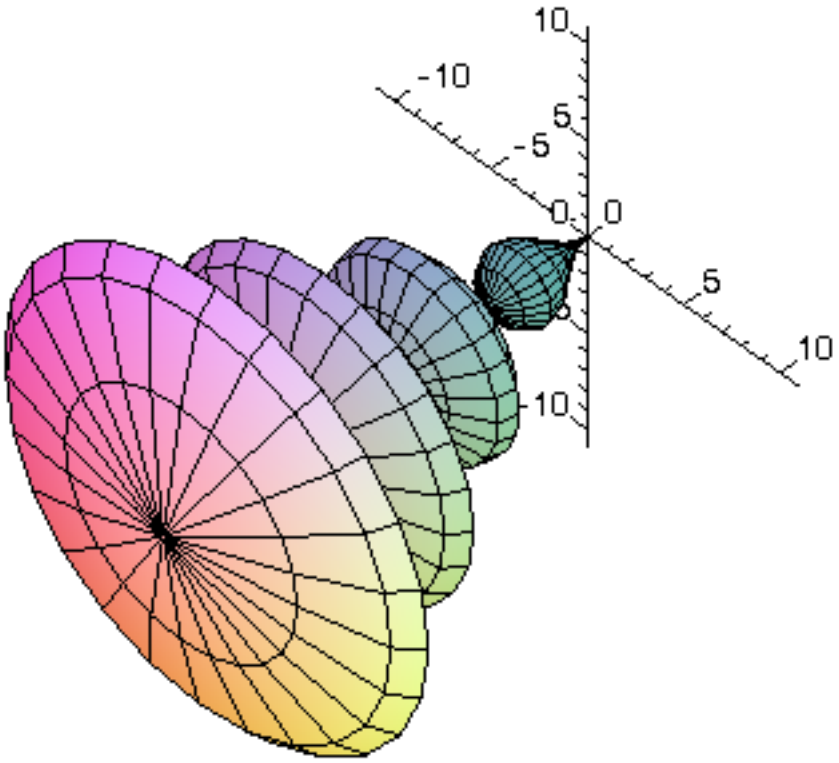
```
> plot3d([x*cos(s),exp(x),x*sin(s)],x=-2..2,s=0..2*Pi, axes=
  normal,style=wireframe,color=black);
```




```
> plot3d([x,exp(x)*cos(s),exp(x)*sin(s)],x=-2..2,s=0..2*Pi, axes=
  normal,style=wireframe,color=black);
```




```
> plot3d([x,x*sin(x)*cos(s),x*sin(x)*sin(s)],x=0..4*Pi,s=0..2*Pi,
  axes=normal);
```




```
> f:=(x,y)->(-x*y^2)/(x^2+y^2);
```

$$f := (x, y) \to -\frac{x\,y^2}{x^2+y^2}$$

```
> f(1/2,1);
```

$$-\frac{2}{5}$$

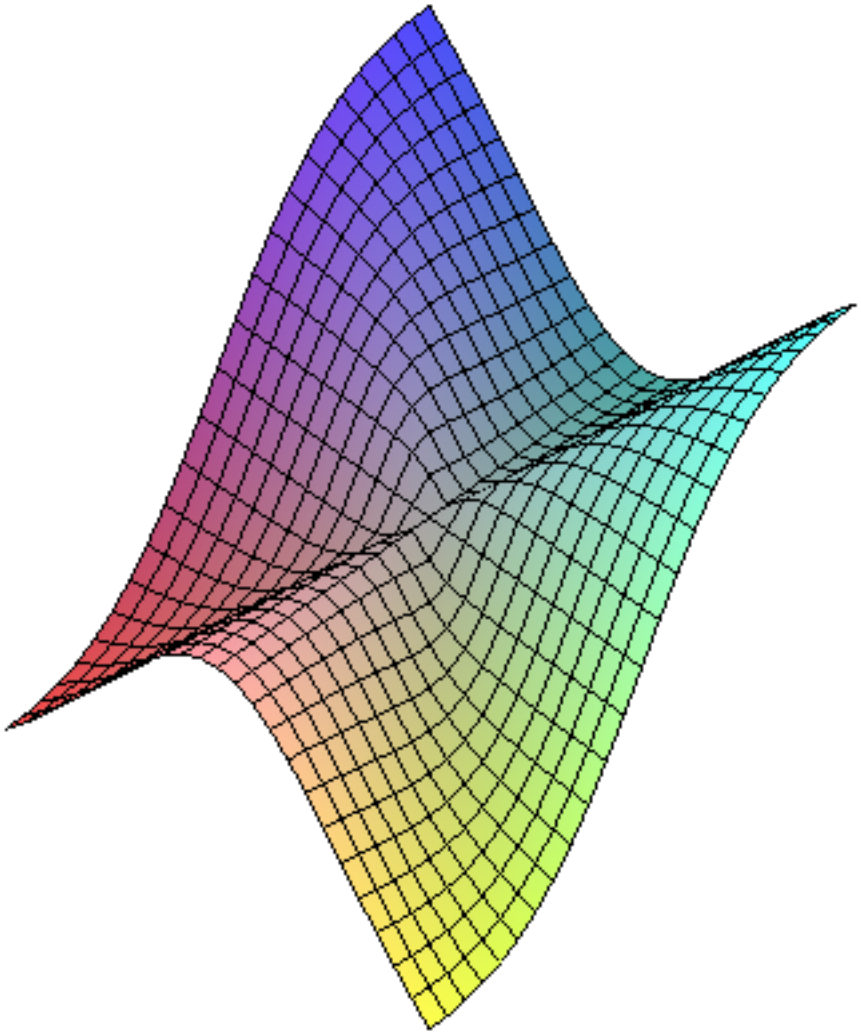
```
> Limit(f(x,y),{x=1/2,y=1})=limit(f(x,y),{x=1/2,y=1});
```

$$Limit\left(-\frac{x\,y^2}{x^2+y^2}, \left\{x=\frac{1}{2}, y=1\right\}\right) = -\frac{2}{5}$$

```
> Limit(f(x,y),{x=1/2,y=infinity})=limit(f(x,y),{x=1/2,y=infinity}
  );
```

$$Limit\left(-\frac{x\,y^2}{x^2+y^2}, \left\{x=\frac{1}{2}, y=\infty\right\}\right) = -\frac{1}{2}$$

```
> plot3d(f(x,y),x=-0.1..0.1,y=-0.1..0.1);
```



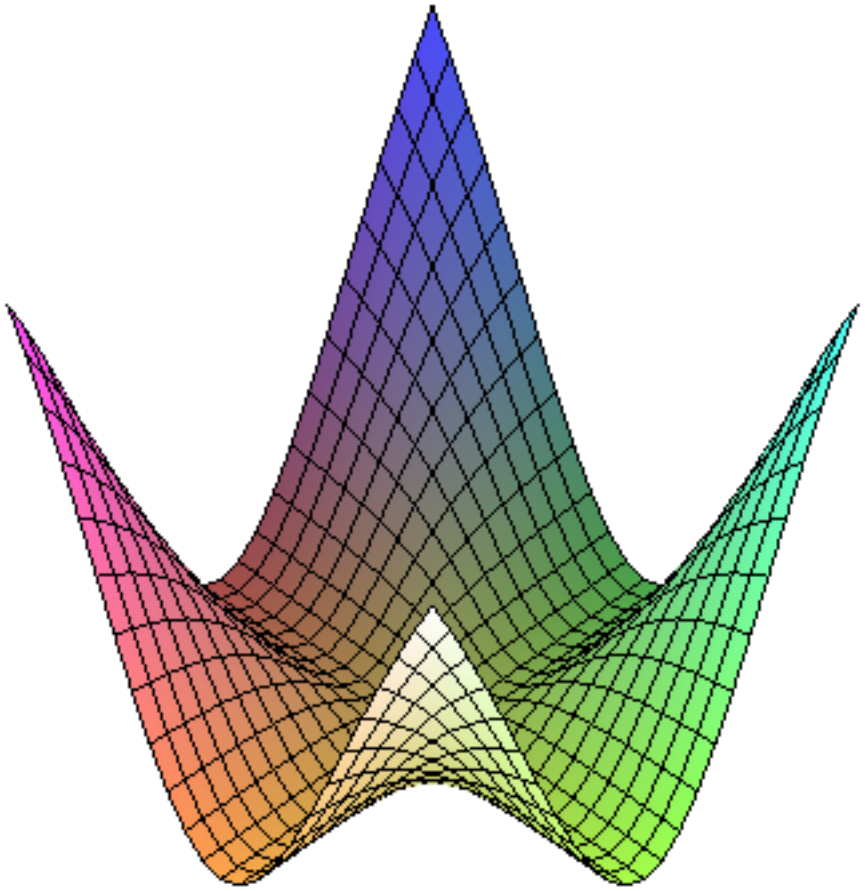
```
> Limit(f(x,m*x),{x=0})=limit(f(x,m*x),{x=0});
```

$$Limit\left(-\frac{x^3 m^2}{x^2+m^2 x^2}, \{x=0\}\right)=0$$

```
> g:=(x,y)->(x^2*y^2)/(x^2+y^2);
```

$$g := (x, y) \rightarrow \frac{x^2 y^2}{x^2+y^2}$$

```
> plot3d(g(x,y),x=-0.1..0.1,y=-0.1..0.1);
```



```
> Limit(g(x,m*sqrt(x)),{x=0})=limit(g(x,m*x),{x=0});
```

$$Limit\left(\frac{x^3 m^2}{x^2+m^2 x},\ \{x=0\}\right)=0$$

```
> Diff(f(x,y),x,y)=diff(f(x,y),x,y);
```

$$\frac{\partial^2}{\partial y\,\partial x}\left(\frac{x^2 y^2}{x^2+y^2}\right)=\frac{4xy}{x^2+y^2}-\frac{4xy^3}{(x^2+y^2)^2}-\frac{4x^3 y}{(x^2+y^2)^2}+\frac{8x^3 y^3}{(x^2+y^2)^3}$$

```
> Diff(f(x,y),x)=diff(f(x,y),x);
```

$$\frac{\partial}{\partial x}\left(\frac{x^2 y^2}{x^2+y^2}\right)=\frac{2xy^2}{x^2+y^2}-\frac{2x^3 y^2}{(x^2+y^2)^2}$$

```
> Diff(f(x,y),x$2)=diff(f(x,y),x$2);
```

$$\frac{\partial^2}{\partial x^2}\left(\frac{x^2 y^2}{x^2+y^2}\right)=\frac{2y^2}{x^2+y^2}-\frac{10x^2 y^2}{(x^2+y^2)^2}+\frac{8x^4 y^2}{(x^2+y^2)^3}$$

```
> D[1,2](f);
```

$$(x, y) \to \frac{4\,y\,x}{x^2+y^2} - \frac{4\,x^3\,y}{\left(x^2+y^2\right)^2} - \frac{4\,x\,y^3}{\left(x^2+y^2\right)^2} + \frac{8\,x^3\,y^3}{\left(x^2+y^2\right)^3}$$

```
> D[1$2](f);
```

$$(x, y) \to \frac{2\,y^2}{x^2+y^2} - \frac{10\,x^2\,y^2}{\left(x^2+y^2\right)^2} + \frac{8\,x^4\,y^2}{\left(x^2+y^2\right)^3}$$

```
> D[1](f);
```

$$(x, y) \to \frac{2\,x\,y^2}{x^2+y^2} - \frac{2\,x^3\,y^2}{\left(x^2+y^2\right)^2}$$

```
> h:=D[1$2,2$3](f);
```

$$h := (x, y) \to -\frac{48\,y}{\left(x^2+y^2\right)^2} + \frac{480\,x^2\,y}{\left(x^2+y^2\right)^3} - \frac{576\,x^4\,y}{\left(x^2+y^2\right)^4} + \frac{144\,y^3}{\left(x^2+y^2\right)^3} - \frac{2160\,x^2\,y^3}{\left(x^2+y^2\right)^4} + \frac{3456\,x^4\,y^3}{\left(x^2+y^2\right)^5} - \frac{96\,y^5}{\left(x^2+y^2\right)^4} + \frac{1920\,x^2\,y^5}{\left(x^2+y^2\right)^5} - \frac{3840\,x^4\,y^5}{\left(x^2+y^2\right)^6}$$

```
> h(1,1);
```

$$-3$$