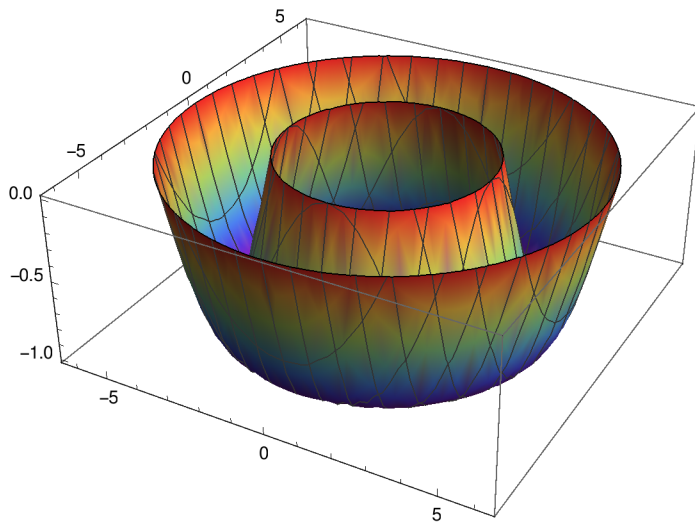In[2]:= **SetOptions[Plot3D**(*Or whichever plot you desire*),
    ColorFunction → "Rainbow"(*One of many options*)**];**
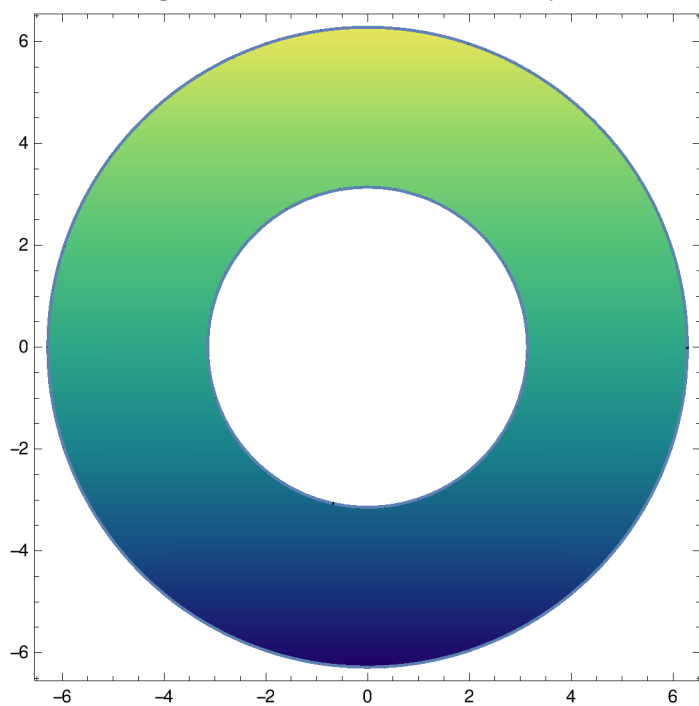
In[3]:= **SetOptions[RegionPlot**(*Or whichever plot you desire*),
    ColorFunction → "BlueGreenYellow"(*One of many options*)**];**

(*2a*)

Plot3D[{Sin[Sqrt[x^2 + y^2]]}, {x, -2 Pi, 2 * Pi}, {y, -2 Pi, 2 * Pi},
 RegionFunction → Function[{x, y, z}, Pi^2 < x^2 + y^2 < 4 * Pi^2]]
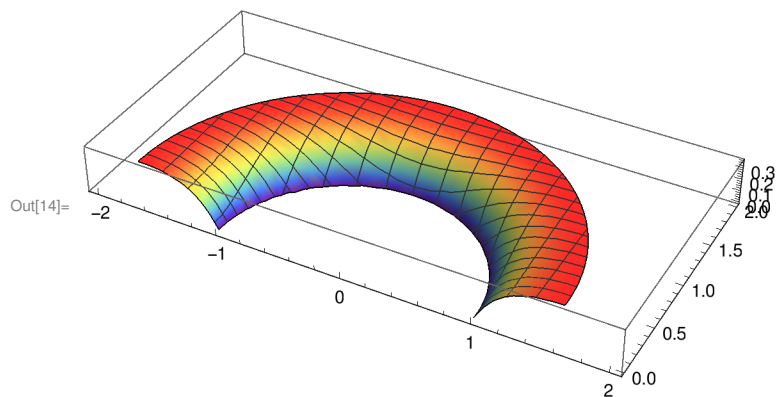
RegionPlot$\left[$**Pi^2 < x^2 + y^2 < 4 * Pi^2, {x, -2 Pi, 2 * Pi}, {y, -2 Pi, 2 * Pi}**$\right]$

(*2b*)

In[14]:= **Plot3D**$\left[\left\{$**Log[x * x + y * y] $/$ (x * x + y * y)**$\right\}$**, {x, -2, 2}, {y, 0, 2},**
RegionFunction → Function$\left[$**{x, y, z}, E > x^2 + y^2 > 1**$\right]$**, BoxRatios → Automatic**$\right]$

Out[14]=

In[12]:= **RegionPlot$\left[$E > x^2 + y^2 > 1, $\{$x, -2, 2$\}$, $\{$y, 0, 2$\}$, AspectRatio → Automatic$\right]$**

Out[12]=
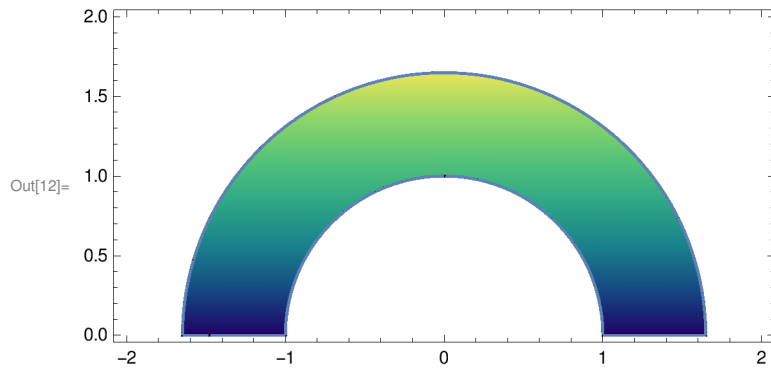
(*2c*)

Plot3D$\left[\{$x$\}$, $\{$x, 0, 2$\}$, $\{$y, 0, 2$\}$,
 RegionFunction → Function$\left[\{$x, y, z$\}$, 1 < x^2 + y^2 < 4$\right]$, BoxRatios → Automatic$\right]$
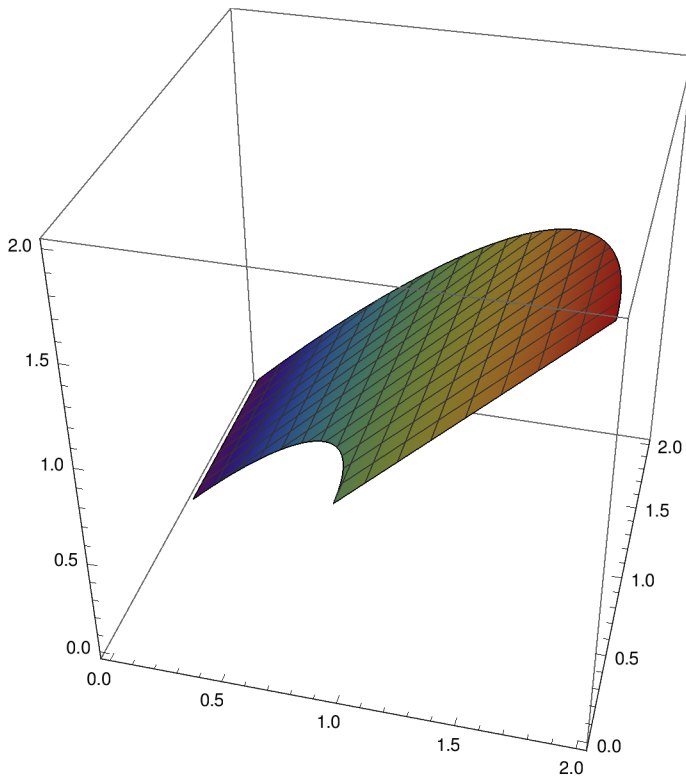
RegionPlot$\left[1 < x^2 + y^2 < 4, \{x, 0, 2\}, \{y, 0, 2\}\right]$
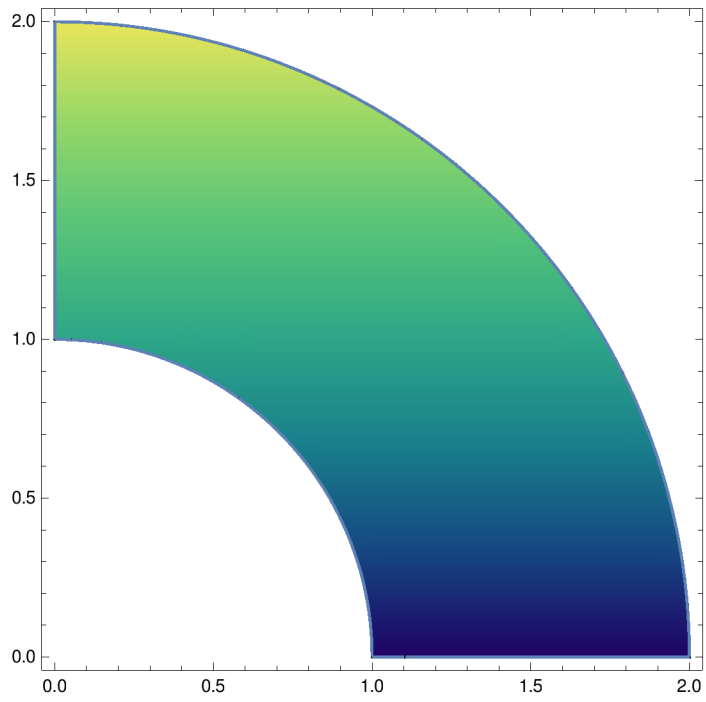
```
(*2d*)
Plot3D[{x^2+y^2}, {x, -3, 3}, {y, -2, 2},
 RegionFunction → Function[{x, y, z}, 4 x^2 + 9 y^2 < 36], BoxRatios → Automatic]
```
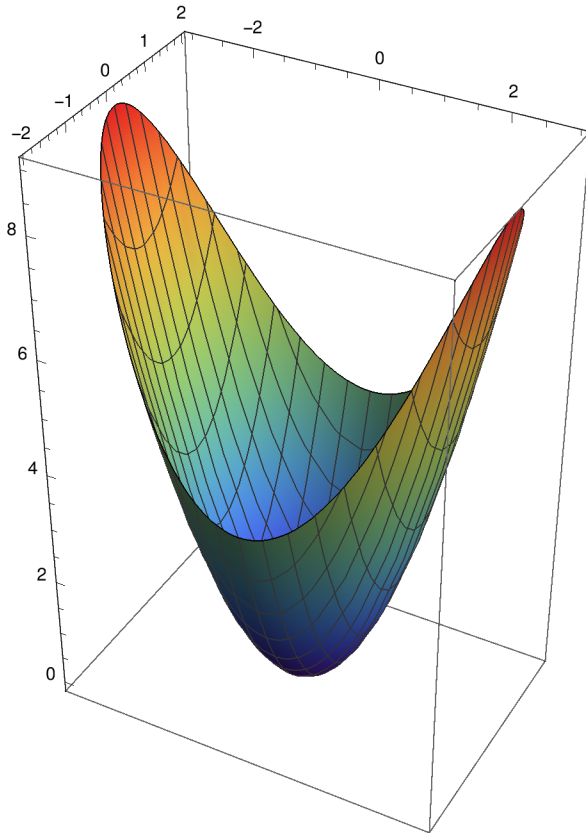


```
RegionPlot[4 x^2 + 9 y^2 < 36, {x, -3, 3}, {y, -2, 2}, AspectRatio → Automatic]
```
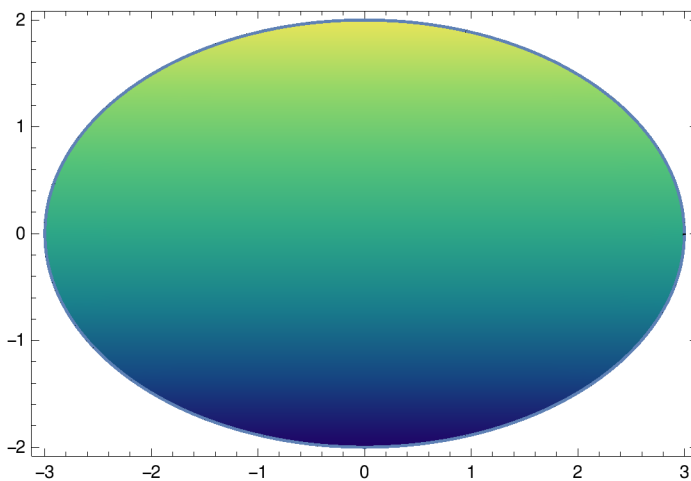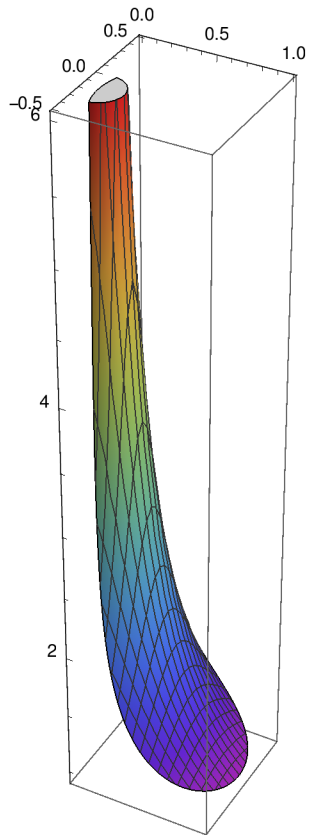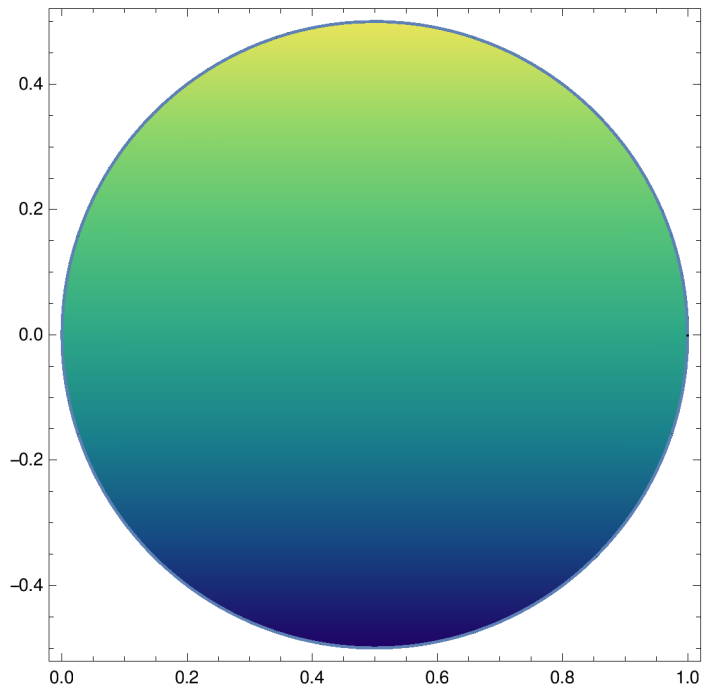
```
(*2e*)
Plot3D[1/Sqrt[{x^2+y^2}], {x, 0, 1}, {y, -0.5, 0.5},
 RegionFunction → Function[{x, y, z}, x^2+y^2 < x], BoxRatios → Automatic]
```
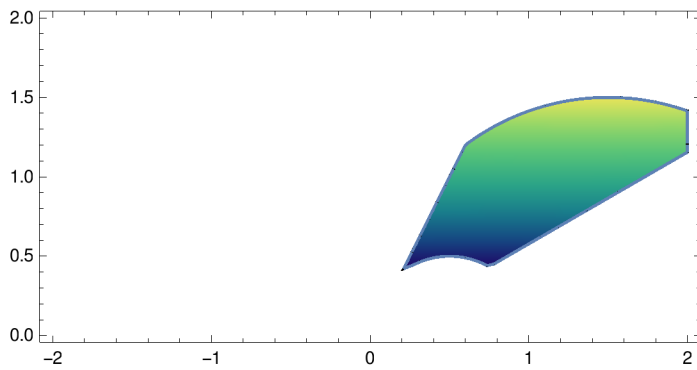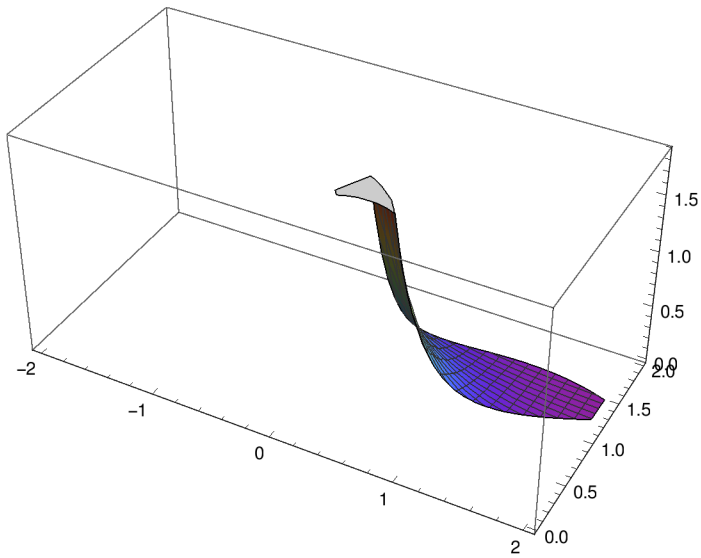
RegionPlot$[$x^2 + y^2 < x, {x, 0, 1}, {y, -0.5, 0.5}, AspectRatio → Automatic$]$

```
(*2f*)
Plot3D[{1 / (x^2 + y^2)^2}, {x, -2, 2}, {y, 0, 2},
 RegionFunction → Function[{x, y, z}, x / Sqrt[3] < y < 2 x && x < x^2 + y^2 < 3 x],
 BoxRatios → Automatic]
RegionPlot[x / Sqrt[3] < y < 2 x && x < x^2 + y^2 < 3 x,
 {x, -2, 2}, {y, 0, 2}, AspectRatio → Automatic]
```
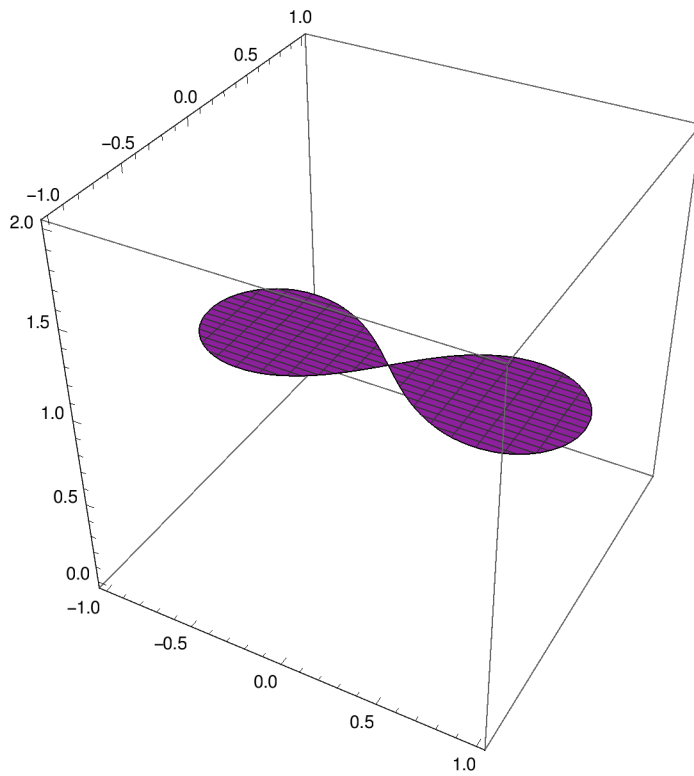


```
(*2g*)
```

```
Plot3D[1, {x, -1, 1}, {y, -1, 1},
  RegionFunction → Function[{x, y, z}, (x^2 + y^2)^2 < x^2 - y^2], BoxRatios → Automatic]
```
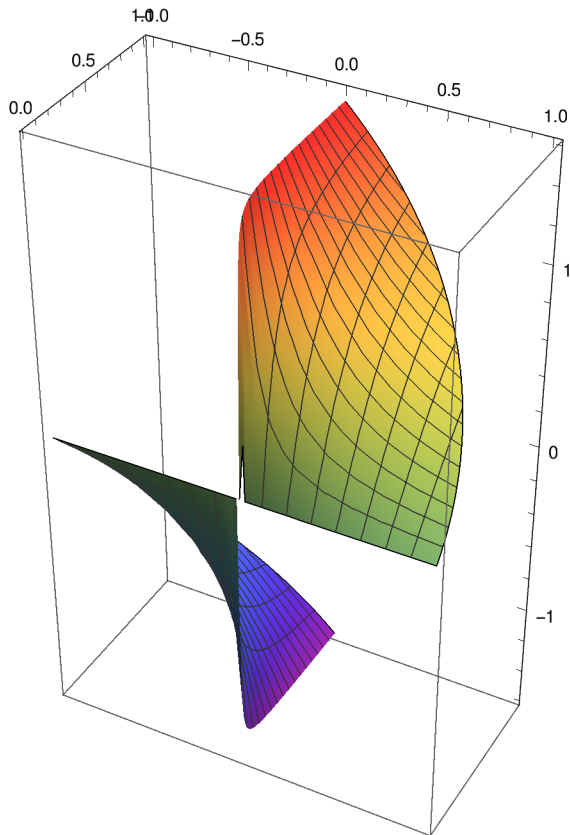


```
RegionPlot[(x^2 + y^2)^2 < x^2 - y^2, {x, -1, 1}, {y, -1, 1}]
```
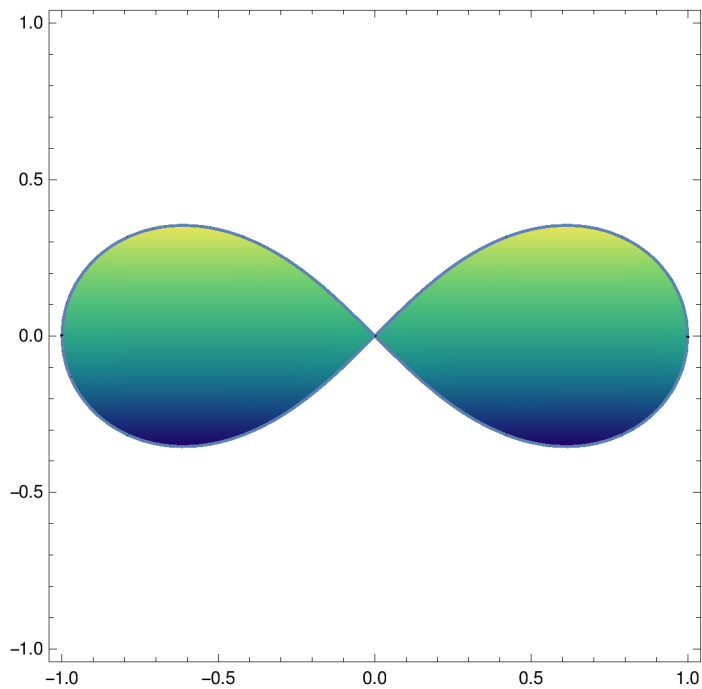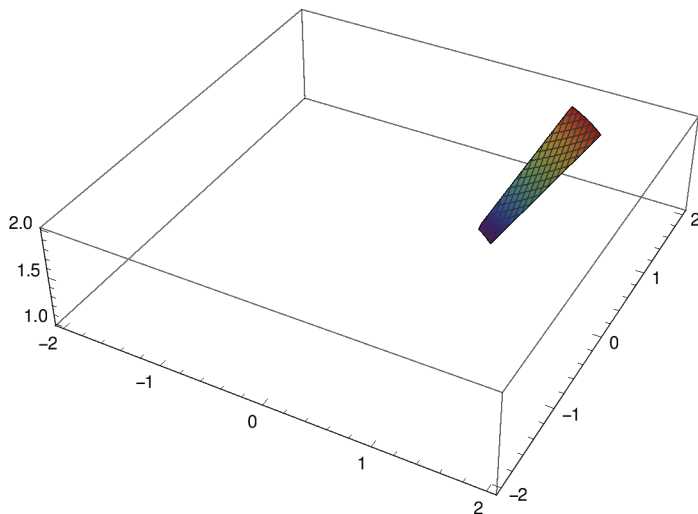
```
(*2h*)
Plot3D[{ArcTan[y / x]}, {x, -1, 1}, {y, 0, 1},
 RegionFunction → Function[{x, y, z}, x^2 + y^2 < 1], BoxRatios → Automatic]

RegionPlot[x^2 + y^2 < 1, {x, -1, 1}, {y, 0, 1}]
```
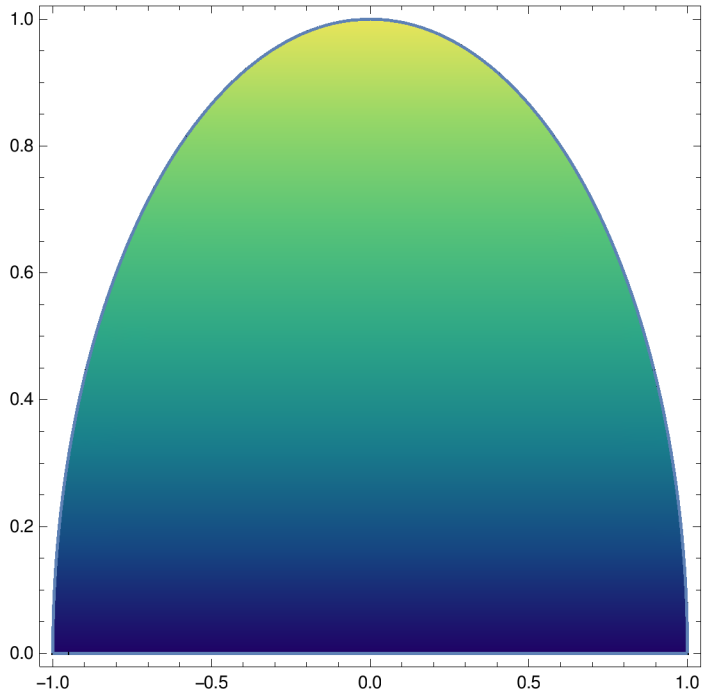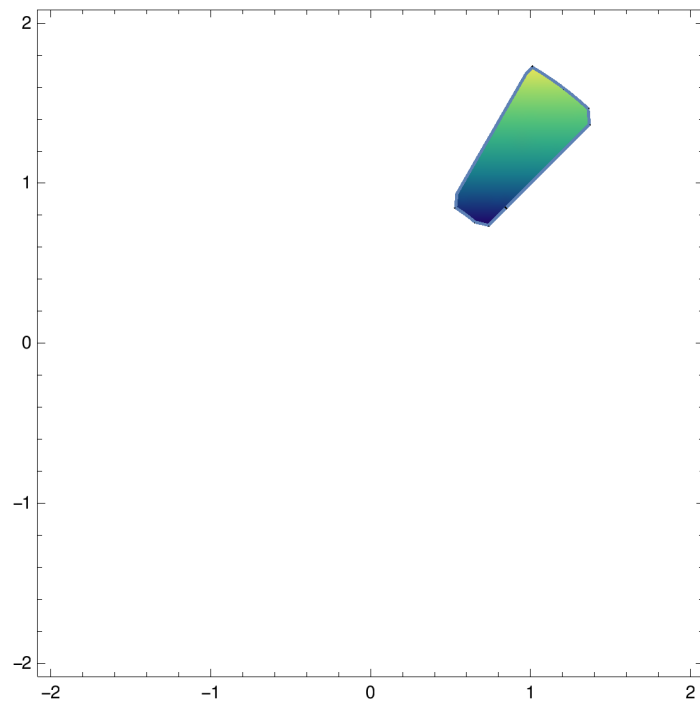
(*2i*)
Plot3D[{Sqrt[x^2 + y^2]}, {x, -2, 2}, {y, -2, 2}, RegionFunction →
   Function[{x, y, z}, 1 < x^2 + y^2 < 4 && x < y < x * Sqrt[3]], BoxRatios → Automatic]

RegionPlot$\big[$**1** < **x^2** + **y^2** < **4 && x** < **y** < **x** * **Sqrt**$\big[$**3**$\big]$, $\{$**x, −2, 2**$\}$, $\{$**y, −2, 2**$\}\big]$

```
(*2j*)
Plot3D[{x^2 y^2}, {x, 0, 3}, {y, 1, 3},
 RegionFunction → Function[{x, y, z}, 1 < x * y < 3 && x < y < 2 x], BoxRatios → Automatic]
```
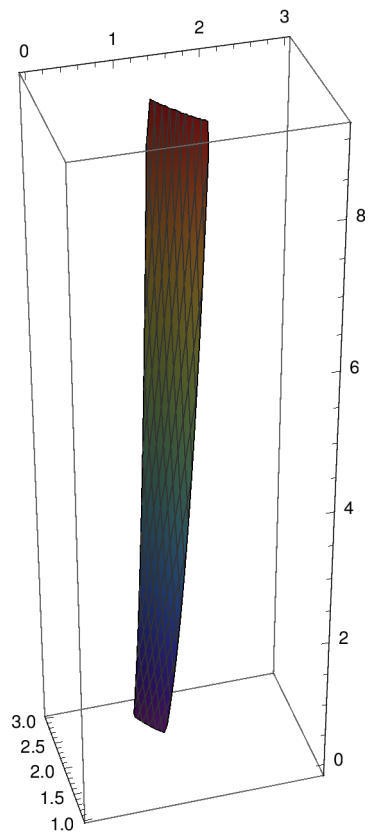
RegionPlot$\left[1 < x * y < 3 \,\&\&\, x < y < 2\, x, \{x, 0, 3\}, \{y, 1, 3\}\right]$
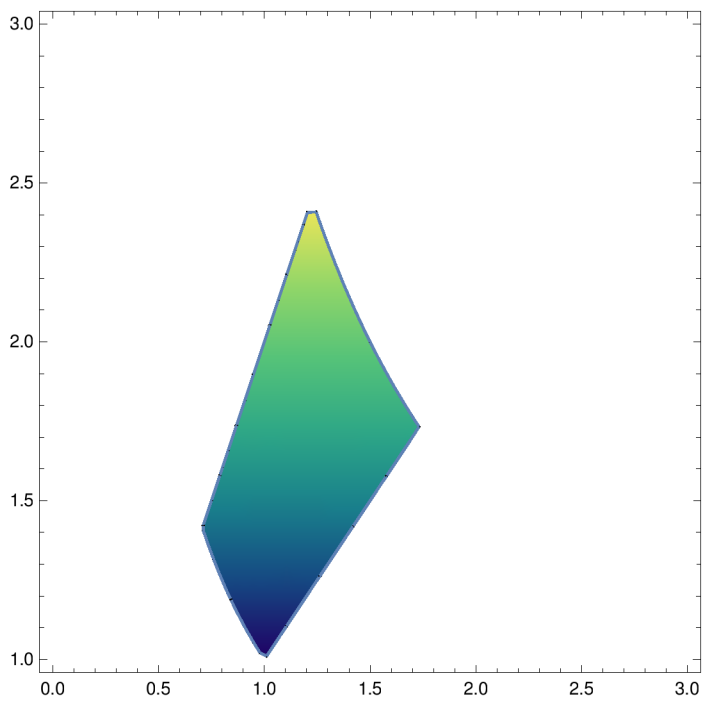
(*2k)

Plot3D$\left[\{1 / (x\text{^}2 + y\text{^}2)\text{^}2\}, \{x, 0, 8\}, \{y, -4, 4\},$
RegionFunction → Function$\left[\{x, y, z\}, x\text{^}2 + y\text{^}2 > 4\, x \,\&\&\, x\text{^}2 + y\text{^}2 < 8\, x\right]\right]$
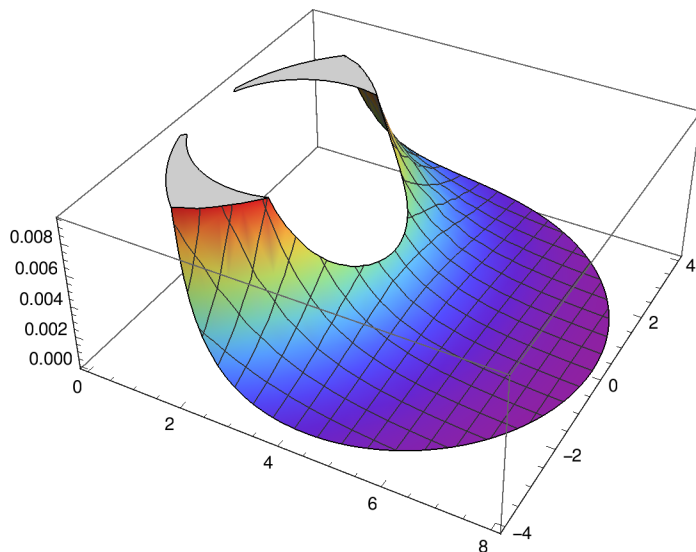
RegionPlot$\left[\text{x\textasciicircum 2 + y\textasciicircum 2 > 4 x \&\& x\textasciicircum 2 + y\textasciicircum 2 < 8 x, \{x, 0, 8\}, \{y, -4, 4\}}\right]$
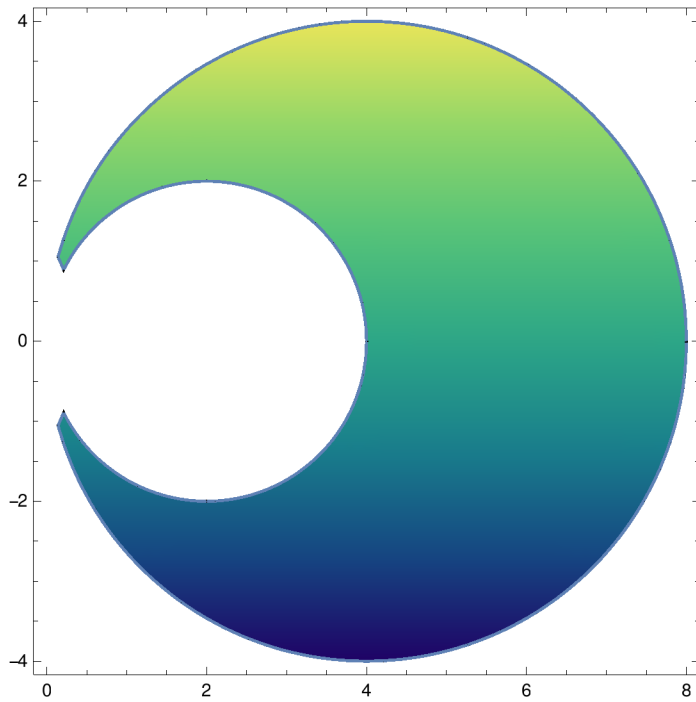
RegionPlot$\left[\text{x\textasciicircum 2 + y\textasciicircum 2 > 4 x \&\& x\textasciicircum 2 + y\textasciicircum 2 < 8 x \&\& y > x \&\& y < 2 x, \{x, 0, 8\}, \{y, -4, 4\}}\right]$
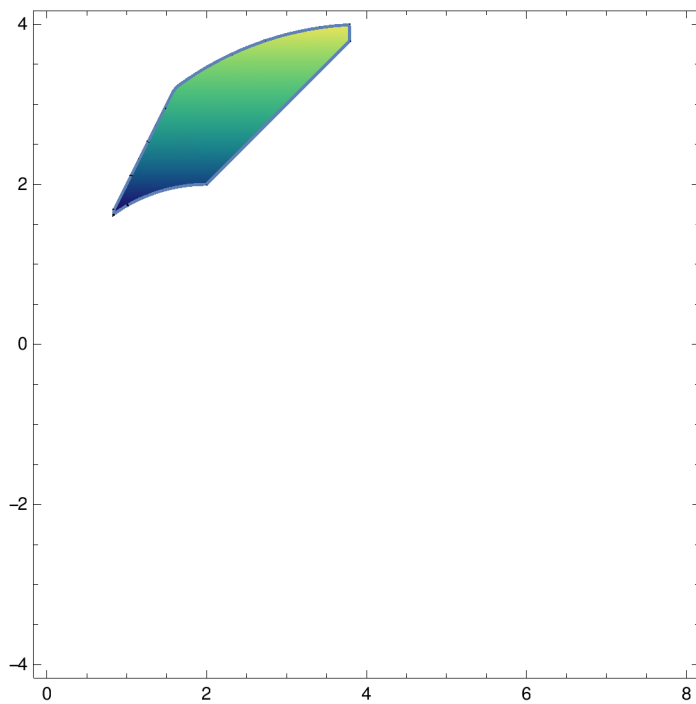
```
(*2l*)
Plot3D[1, {x, 0, 0.3}, {y, 0, 0.3},
 RegionFunction → Function[{x, y, z}, (x + y)^4 < 2 x^2 y], BoxRatios → Automatic]
RegionPlot[(x + y)^4 < 2 x^2 y, {x, 0, 0.3}, {y, 0, 0.3}]
```
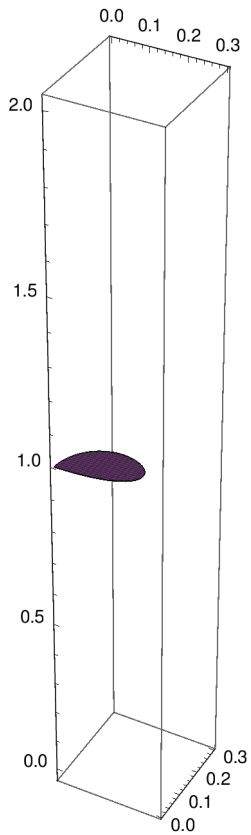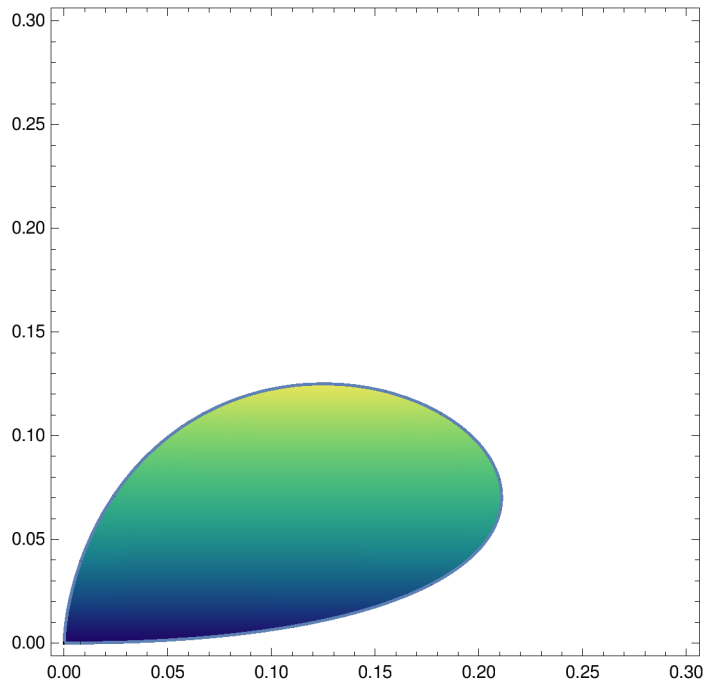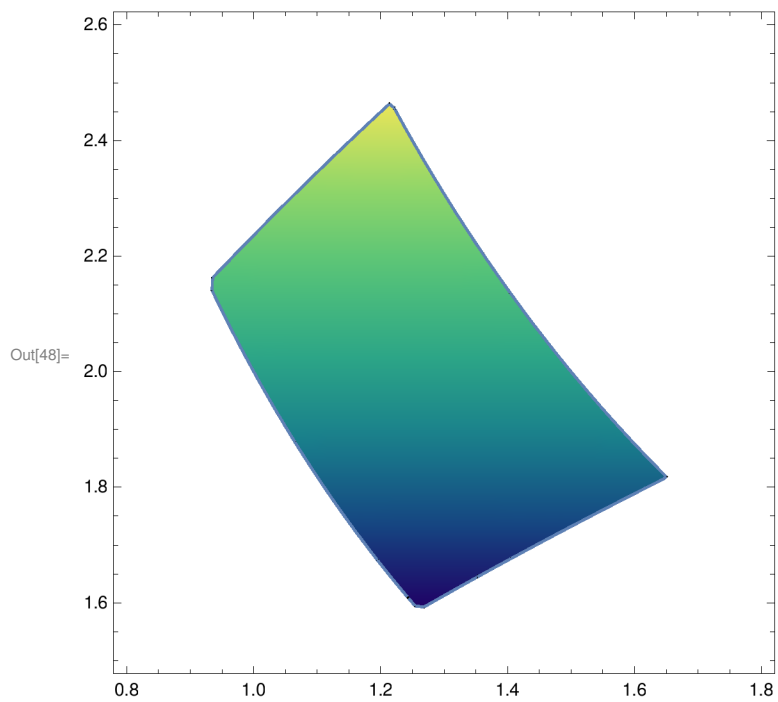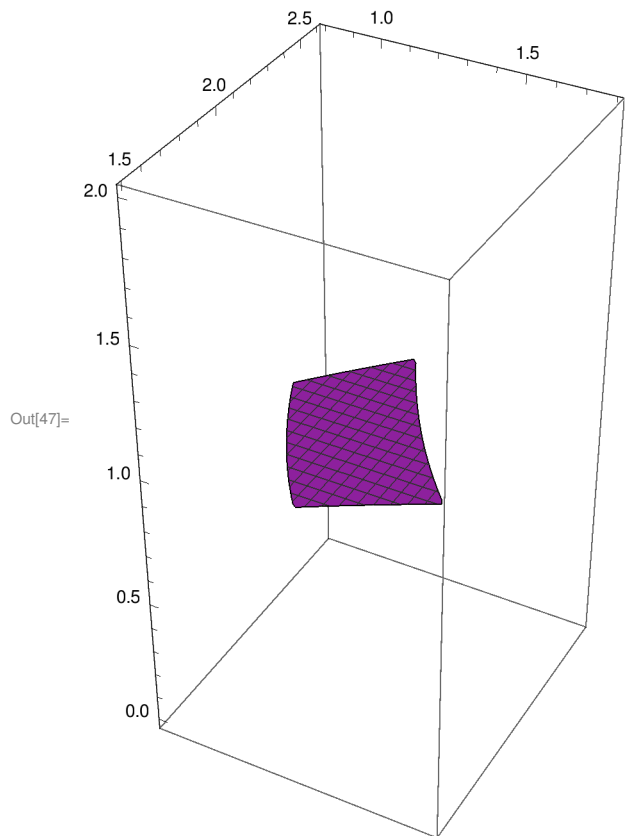
In[47]:=

```
(*2m*)
Plot3D[1, {x, 0.8, 1.8}, {y, 1.5, 2.6}, RegionFunction →
  Function[{x, y, z}, 2 < x * y < 3 && 2 x < y^2 < 5 x], BoxRatios → Automatic]
RegionPlot[2 < x * y < 3 && 2 x < y^2 < 5 x, {x, 0.8, 1.8}, {y, 1.5, 2.6}]
```

Out[47]=

Out[48]=

In[37]:= **(*2n*)**
Plot3D$[$y^3 / x^3, $\{$x, 0.5, 2.5$\}$, $\{$y, 1, 2$\}$,
 RegionFunction → Function$[\{$x, y, z$\}$, 1 < x * y < 3 && x < y^2 < 2 x$]$, BoxRatios → Automatic$]$
RegionPlot$[$1 < x * y < 3 && x < y^2 < 2 x, $\{$x, 0.5, 2.5$\}$, $\{$y, 1, 2$\}]$

Out[37]=

Out[38]=