P3

PRACTICE 3: REPRESENTATION OF CURVES IN IMPLICIT FORM

▼ Proposed Exercise P-3.1

Given the following family of curves:

$1=5x^2+4y^2$; $0=15-7x^2-5y^2$

a) Make the graphical representation of the curves using the same axes.

b) Give a different colour to each of the graphs.

c) Insert a label to each of the functions.

d) Insert axes and delete the frame.

▼ Resolution P-3.1

★ a) Function definition and graphical representation using the same axes

```
f1[x_, y_] = 5 x^2 + 4 y^2 - 1; f2[x_, y_] = 1 - 7 x^2 - y^2;
g1 = ContourPlot[f1[x, y] == 0, {x, -0.6, 0.6}, {y, -1, 1}];
g2 = ContourPlot[f2[x, y] == 0, {x, -0.6, 0.6}, {y, -1, 1}];
```


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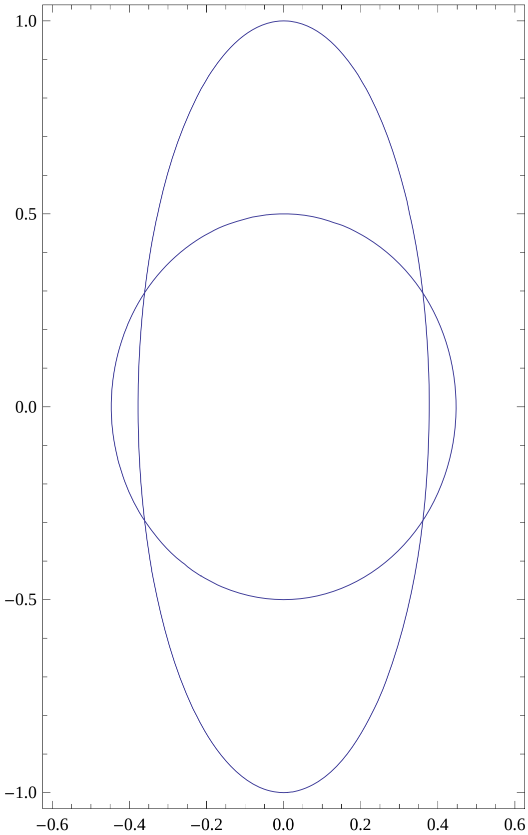
```
Show[{g1, g2}, AspectRatio → Automatic]
```



⋆ b) Giving a different colour to each of the graphs

```
g1 = ContourPlot[f1[x, y] == 0, {x, -0.6, 0.6},
   {y, -1, 1}, ContourStyle → {Thickness[0.01], Magenta}];
g2 = ContourPlot[f2[x, y] == 0, {x, -0.6, 0.6}, {y, -1, 1},
   ContourStyle → {Thickness[0.01], Cyan}];
```

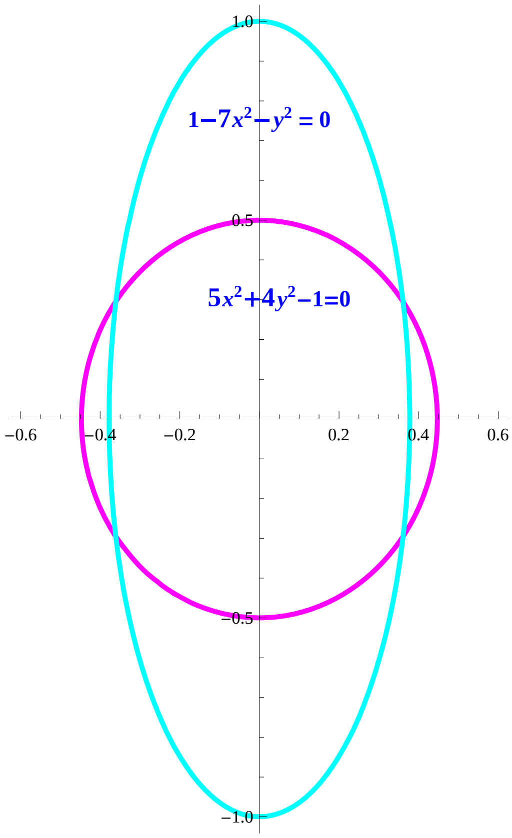
```
Show[{g1, g2}, AspectRatio → Automatic];
```

⋆ c) Inserting labels

```
Show[{g1, g2}, AspectRatio → Automatic,
  Epilog → {Text[Style["5x²+4y²-1=0", Medium, Bold, Blue], {0.05, 0.3}],
    Text[Style["1-7x²-y² = 0", Medium, Bold, Blue], {0.0, .75}]}];
```

★ d) Inserting axes and deleting the frame

```
Show[{g1, g2}, AspectRatio → Automatic, Axes → True, Frame → False,
 Epilog → {Text[Style["5x²+4y²-1=0", Medium, Bold, Blue], {0.05, 0.3}],
   Text[Style["1-7x²-y² = 0", Medium, Bold, Blue], {0.0, .75}]}]
```



▼ Proposed Exercise P-3.2

a) Define the following functions: f(x,y) = sin(x)sin(y) - 0,5 and g(x,y) = cos(x)cos(y) - 0,5.
b) Make the graphical representation of the functions f(x,y), f(x,y) = 0 and g(x,y) = 0 using the same axes, using different colours for each of the functions and giving a colour to the back of the figure.

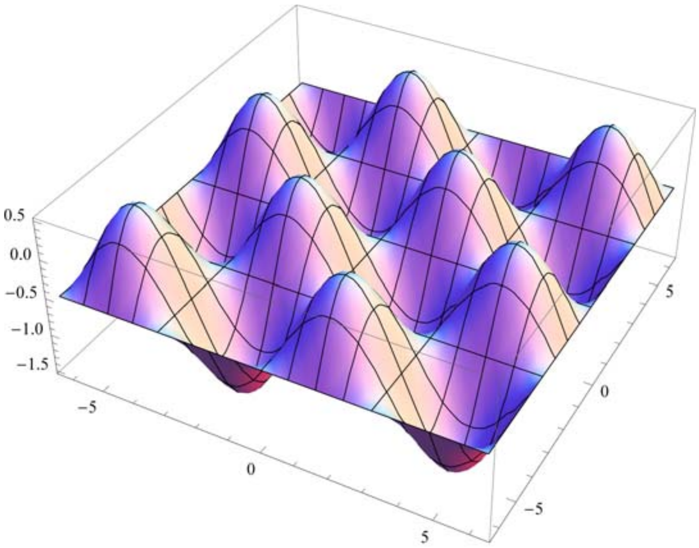
▼ Resolution P-3.2

★ a) Function definition

```
f[x_, y_] = Sin[x] * Sin[y] - 0.5;
g[x_, y_] = Cos[x] * Cos[y] - 0.5;
```

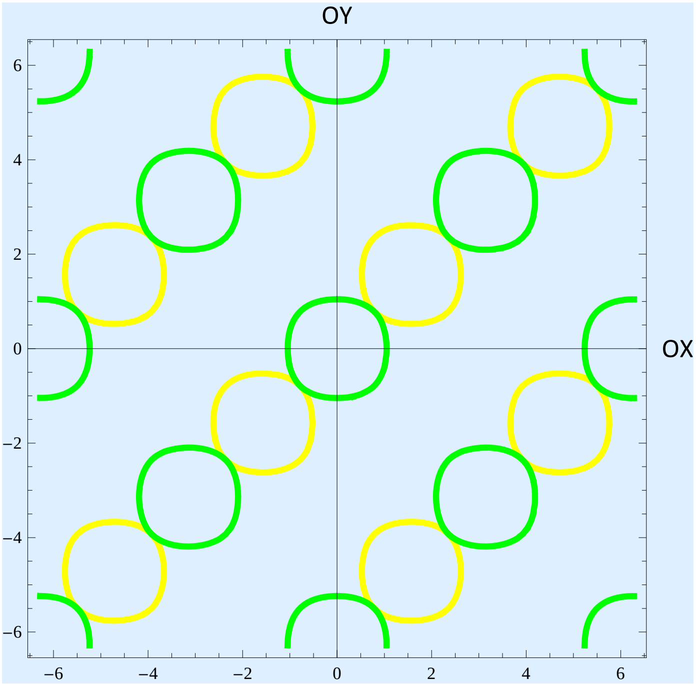
★ **b) Graphical representation of the function f(x,y)**

```
Plot3D[{f[x, y]}, {x, -2 π, 2 π}, {y, -2 π, 2 π}]
```



★ **b) Graphical representation of f(x,y)=0 and g(x,y)=0**

```
ContourPlot[{f[x, y] == 0, g[x, y] == 0}, {x, -2 π, 2 π}, {y, -2 π, 2 π},
 ContourStyle → {{Thickness[0.01], Yellow}, {Thickness[0.01], Green}},
 Axes → True, AxesLabel → {"OX", "OY"}, Background → LightBlue]
```



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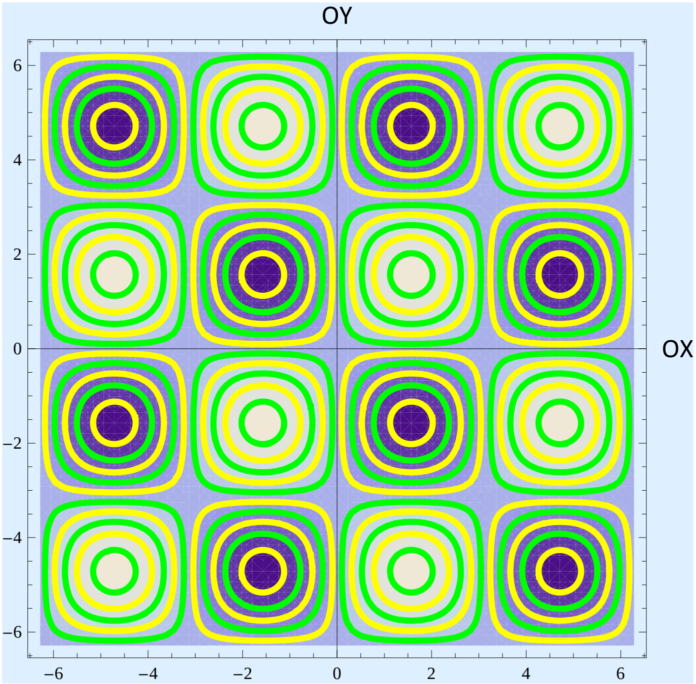
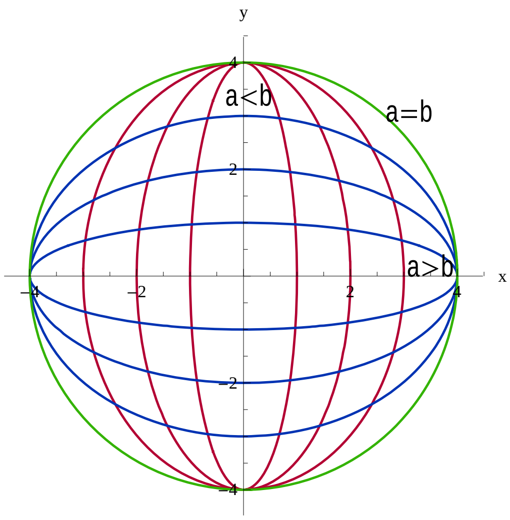
```
ContourPlot[{f[x, y]}, {x, -2 π, 2 π}, {y, -2 π, 2 π},
 ContourStyle → {{Thickness[0.01], Yellow}, {Thickness[0.01], Green}},
 Axes → True, AxesLabel → {"OX", "OY"}, Background → LightBlue]
```



▼ Proposed Exercise P-3.3

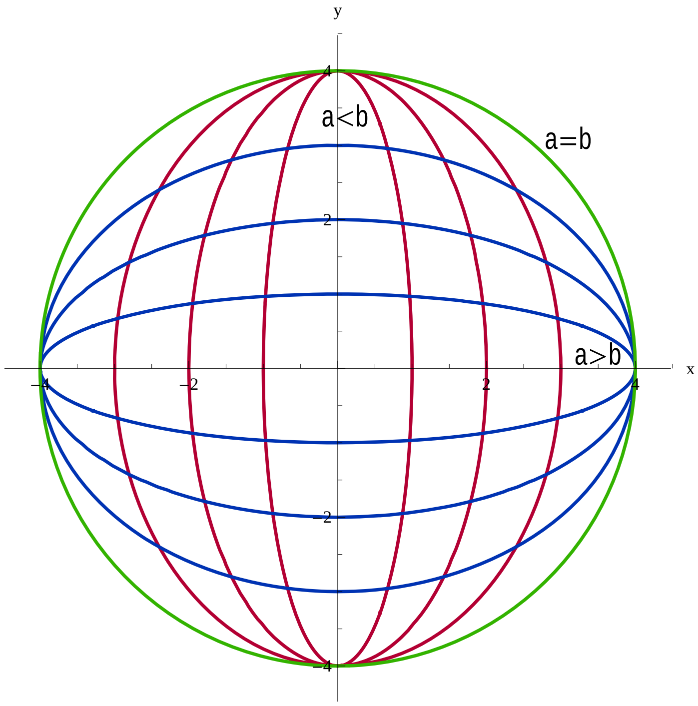
Make the graphical representation of the family of ellipses:



▼ Resolution P-3.3

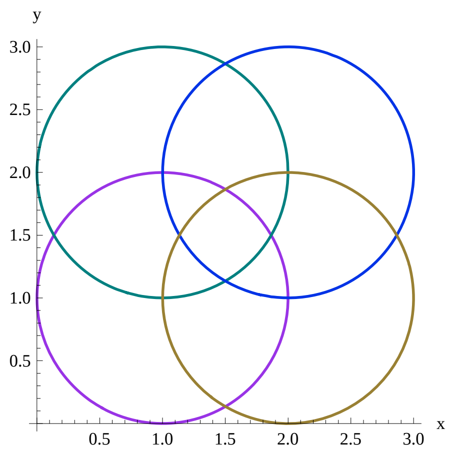
```
a = ContourPlot[{y^2 / 16 + x^2 / 1 == 1, y^2 / 16 + x^2 / 4 == 1, y^2 / 16 + x^2 / 9 == 1},
   {x, -4, 4}, {y, -4, 4}, Frame → False, Axes → True, AxesLabel → {"x", "y"},
   ContourStyle → {{RGBColor[0.7, 0, 0.2], Thickness[0.005]},
     {RGBColor[0.7, 0, 0.2], Thickness[0.005]}, {RGBColor[0.7, 0, 0.2],
      Thickness[0.005]}, {RGBColor[0.7, 0, 0.2`], Thickness[0.005]}}];
```

```
b = ContourPlot[{x^2 / 16 + y^2 / 1 == 1, x^2 / 16 + y^2 / 4 == 1, x^2 / 16 + y^2 / 9 == 1},
   {x, -4, 4}, {y, -4, 4}, Frame → False, Axes → True, AxesLabel → {"x", "y"},
   ContourStyle → {{RGBColor[0, 0.2, 0.7], Thickness[0.005]}, {RGBColor[0, 0.2, 0.7],
      Thickness[0.005]}, {RGBColor[0, 0.2, 0.7], Thickness[0.005]}}];

c = ContourPlot[{x^2 + y^2 == 16}, {x, -4, 4}, {y, -4, 4}, Frame → False, Axes → True,
   AxesLabel → {"x", "y"}, ContourStyle → {{RGBColor[0.2, 0.7, 0], Thickness[0.005]}}];

labels = {Text["a=b", {3.1, 3.1}], Text["a>b", {3.5, 0.2}], Text["a<b", {0.1, 3.4}]};

Show[a, b, c, PlotRange → {{-4.3, 4.3}, {-4.3, 4.3}}, Epilog → Graphics[labels][[1]]]
```



▼ Proposed Exercise P-3.4

Make the graphical representation of the family of circumferences:



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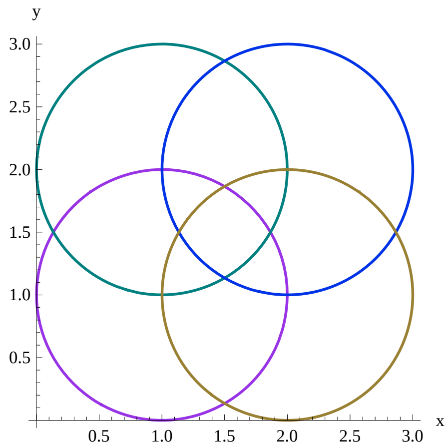
▼ Resolution P-3.4

```
a = ContourPlot[
  {(x - 1)^2 + (y - 1)^2 == 1, (x - 1)^2 + (y - 2)^2 == 1, (x - 2)^2 + (y - 2)^2 == 1, (x - 2)^2 + (y - 1)^2 == 1},
  {x, 0, 3}, {y, 0, 3}, ContourStyle → {{RGBColor[0.6, 0.2, 0.9], Thickness[0.007]},
    {RGBColor[0, 0.5, 0.5], Thickness[0.007]}, {RGBColor[0, 0.2, 0.9],
     Thickness[0.007]}, {RGBColor[0.6, 0.5, 0.2], Thickness[0.007]}},
  Axes → True, AxesLabel → {"x", "y"}, Frame → False]
```



▼ Proposed Exercise P-3.5

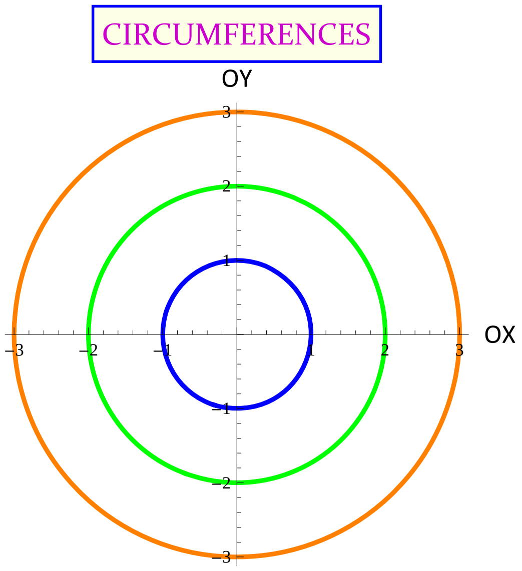
Make the graphical representation of the following curves using the same axes:

$x^2+y^2=1$; $x^2+y^2=4$ and $x^2+y^2=9$

Use a different colour for each one. Call "Circumferences" to the graph, delete the frame, insert the axes and the names of the axes.

▼ Resolution P-3.5

```
a = ContourPlot[{x^2 + y^2 == 1, x^2 + y^2 == 4, x^2 + y^2 == 9},
  {x, -3, 3}, {y, -3, 3}, ContourStyle →
   {{Thickness[0.01], Blue}, {Thickness[0.01], Green}, {Thickness[0.01], Orange}},
  Axes → True, Frame → False, AxesLabel → {"OX", "OY"}, PlotLabel →
   Style[Framed["CIRCUMFERENCES"], 16, Blue, Background → Lighter[LightYellow]]]
```



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