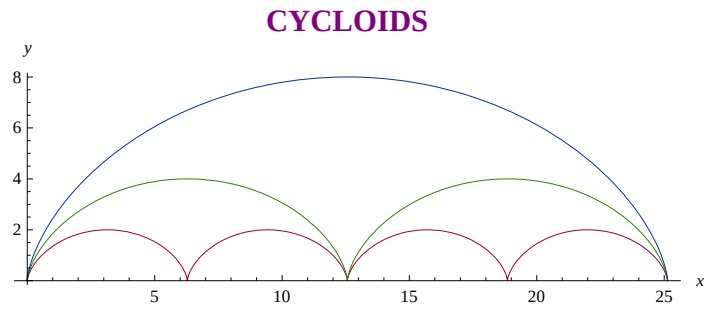
P4

PRACTICE 4: REPRESENTATION OF CURVES IN PARAMETRIC FORM

▼ Proposed Exercise P-4.1

Plot the following cycloid family of curves:



▼ Resolution P-4.1

```
Clear["Global`*"]
cycloid[t_, a_] = a * {t - Sin[t], 1 - Cos[t]}
```

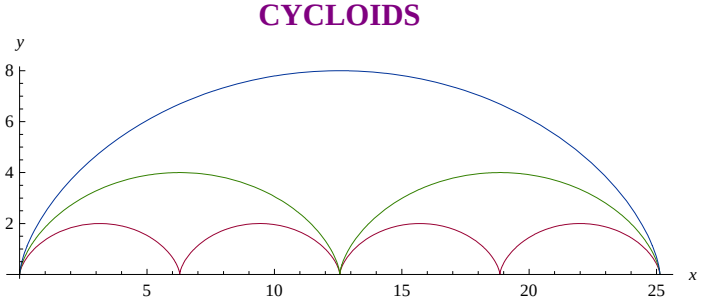
```
{a (t - Sin[t]), a (1 - Cos[t])}
```

```
c1 = ParametricPlot[{cycloid[t, 1]}, {t, 0, 8 * Pi}, PlotStyle → RGBColor[0.6, 0, 0.2]];
```

```
c2 = ParametricPlot[{cycloid[t, 2]}, {t, 0, 4 * Pi}, PlotStyle → RGBColor[0.2, 0.5, 0]];
```

```
c4 = ParametricPlot[{cycloid[t, 4]}, {t, 0, 2 * Pi}, PlotStyle → RGBColor[0, 0.2, 0.6]];
```

```
Show[{c1, c2, c4}, PlotLabel → Style["CYCLOIDS", Bold, Purple, 16],
 AxesLabel → {x, y}, PlotRange → {0, 8}]
```



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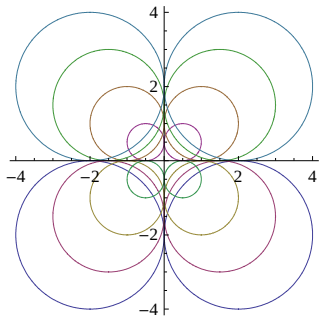
▼ Proposed Exercise P-4.2

Plot the following circle family of curves:



▼ Resolution P-4.2

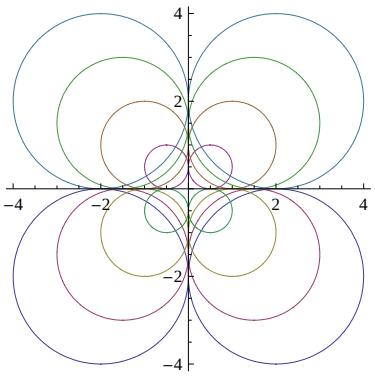
```
circle[t_, a_, b_, r_] = {x[t_], y[t_]} = {a + r * Sin[t], b + r * Cos[t]}
```

```
{a + r Sin[t], b + r Cos[t]}
```

```
c1 = ParametricPlot[Evaluate[Table[circle[t, -i, i, i], {i, -2, 2, 0.5}]],
    {t, 0, 2 Pi}, AspectRatio → Automatic];
```

```
c2 = ParametricPlot[Evaluate[Table[circle[t, i, i, i], {i, -2, 2, 0.5}]],
    {t, 0, 2 Pi}, AspectRatio → Automatic];
```

```
Show[c1, c2]
```



▼ Proposed Exercise P-4.3

Plot the following family of ellipse curves:

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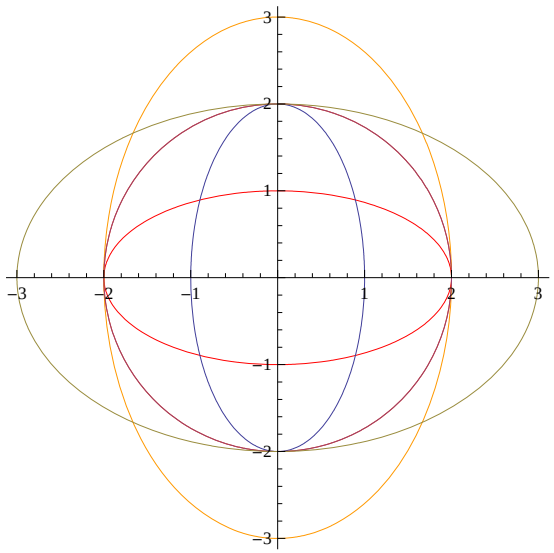
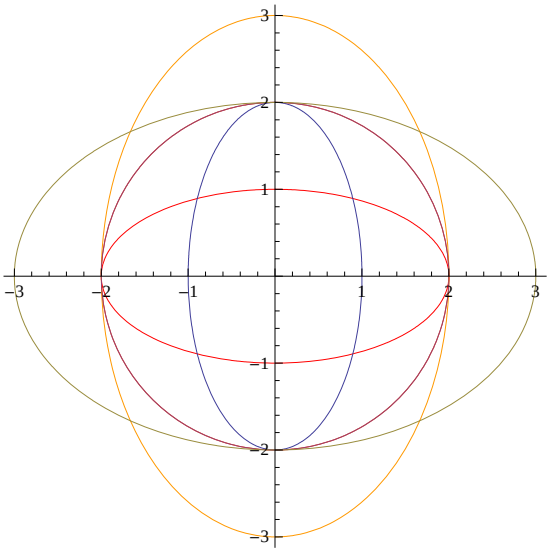


▼ Resolution P-4.3

```
ellipse[t_, a_, b_, c_, d_] = {a * Sin[t], b * Cos[t]} + {c, d};
g1 = ParametricPlot[Evaluate[Table[ellipse[t, 2, i, 0, 0], {i, 1, 3}]], {t, 0, 2 Pi},
    PlotStyle → Table[RGBColor[1, i * 0.3, 0], {i, 0, 2}], AspectRatio → Automatic];
g2 = ParametricPlot[Evaluate[Table[ellipse[t, i, 2, 0, 0], {i, 1, 3}]],
    {t, 0, 2 Pi}, PlotStyle → PlotStyle → Table[RGBColor[0, 1, i * 0.3], {i, 0, 2}],
    AspectRatio → Automatic];
Show[g1, g2, PlotRange → {-3, 3}]
```



▼ Proposed Exercise P-4.4

Plot the following family of astroid curves:

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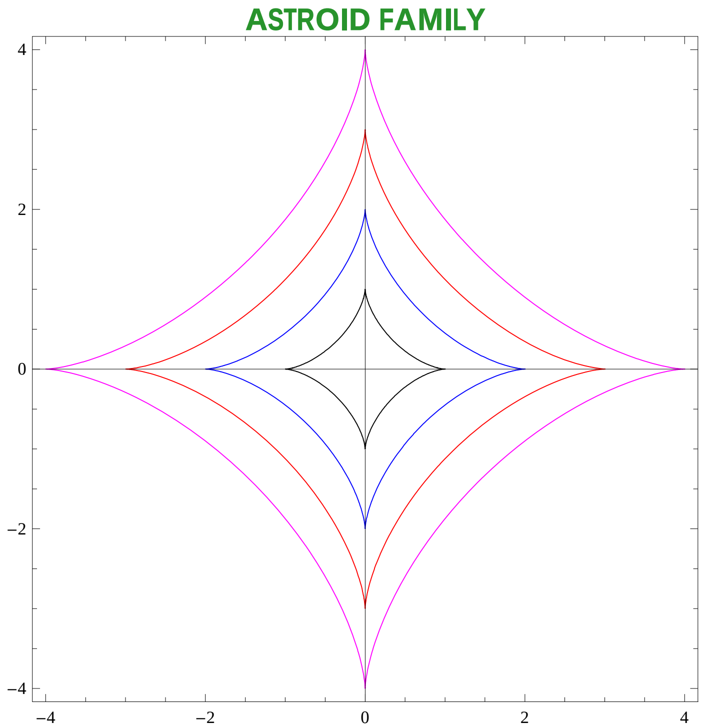

▼ Resolution P-4.4

```
Clear[a]

astroid[t_, a_] = {a * Cos[t]^3, a * Sin[t]^3};

Table[astroid[t, i], {i, 4}]
```

$\{\{\text{Cos}[t]^3, \text{Sin}[t]^3\}, \{2\,\text{Cos}[t]^3, 2\,\text{Sin}[t]^3\}, \{3\,\text{Cos}[t]^3, 3\,\text{Sin}[t]^3\}, \{4\,\text{Cos}[t]^3, 4\,\text{Sin}[t]^3\}\}$

$\{\{\text{Cos}[t]^3, \text{Sin}[t]^3\}, \{2\,\text{Cos}[t]^3, 2\,\text{Sin}[t]^3\}, \{3\,\text{Cos}[t]^3, 3\,\text{Sin}[t]^3\}, \{4\,\text{Cos}[t]^3, 4\,\text{Sin}[t]^3\}\}$

$\{\{\text{Cos}[t]^3, \text{Sin}[t]^3\}, \{2\,\text{Cos}[t]^3, 2\,\text{Sin}[t]^3\}, \{3\,\text{Cos}[t]^3, 3\,\text{Sin}[t]^3\}, \{4\,\text{Cos}[t]^3, 4\,\text{Sin}[t]^3\}\}$

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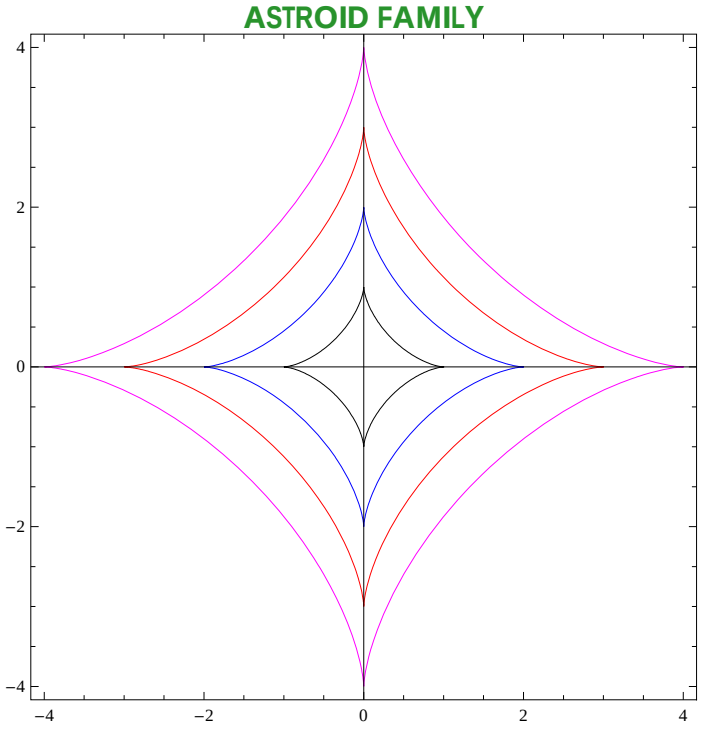
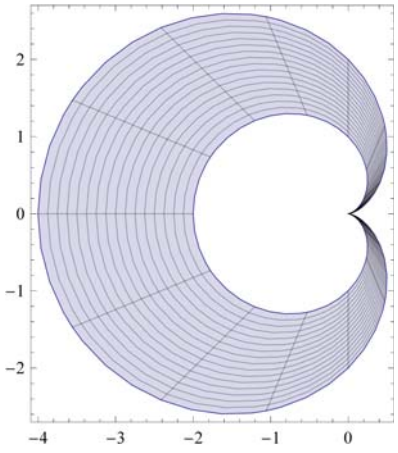
```
ParametricPlot[{{Cos[t]^3, Sin[t]^3}, {2 Cos[t]^3, 2 Sin[t]^3},
  {3 Cos[t]^3, 3 Sin[t]^3}, {4 Cos[t]^3, 4 Sin[t]^3}}, {t, 0, 2 π}, AspectRatio → Automatic,
 PlotStyle → Flatten[Table[RGBColor[a, 0, c], {a, 0, 1}, {c, 0, 1}]],
 PlotLabel → Style["ASTROID FAMILY", Bold, 14], Frame → True]
```



▼ Proposed Exercise P-4.5

Plot the domain situated between the cardioids:



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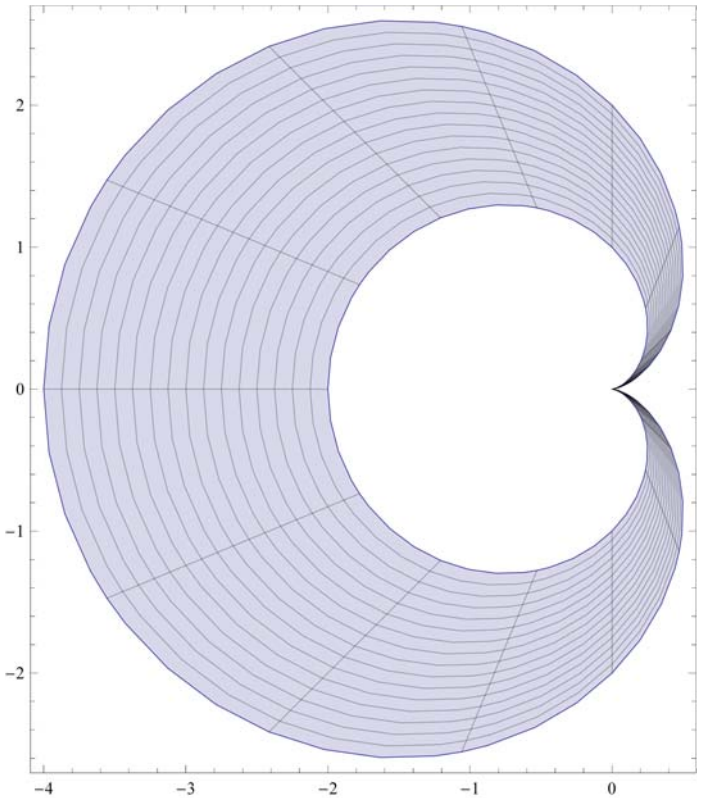
▼ Resolution P-4.5

```
ParametricPlot[{r * (1 - Cos[t]) * Cos[t], r * (1 - Cos[t]) * Sin[t]},
 {t, 0, 2 Pi}, {r, 1, 2}, Axes → False]
```



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