

## Complex Variables - HW 7 - question 4

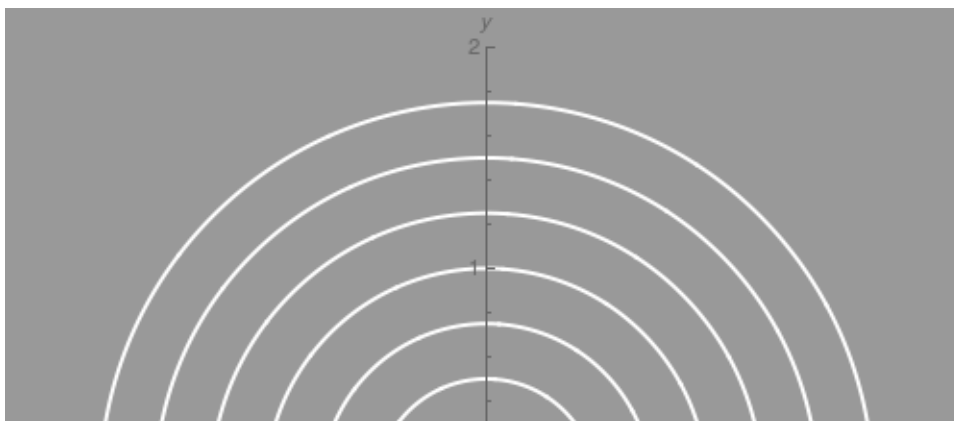
Define a function that allows us to plot the image plane for a set of set of points. I used a set of set to make plotting the graphic objects non connected independent objects.

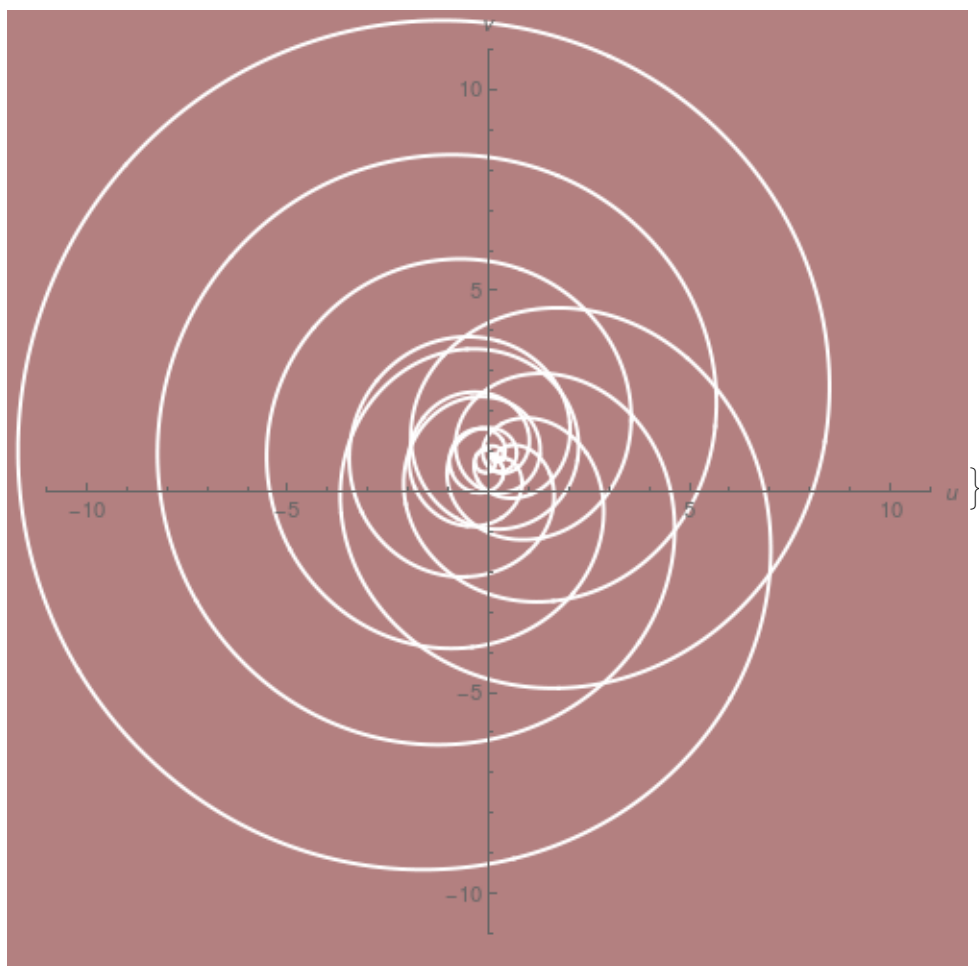
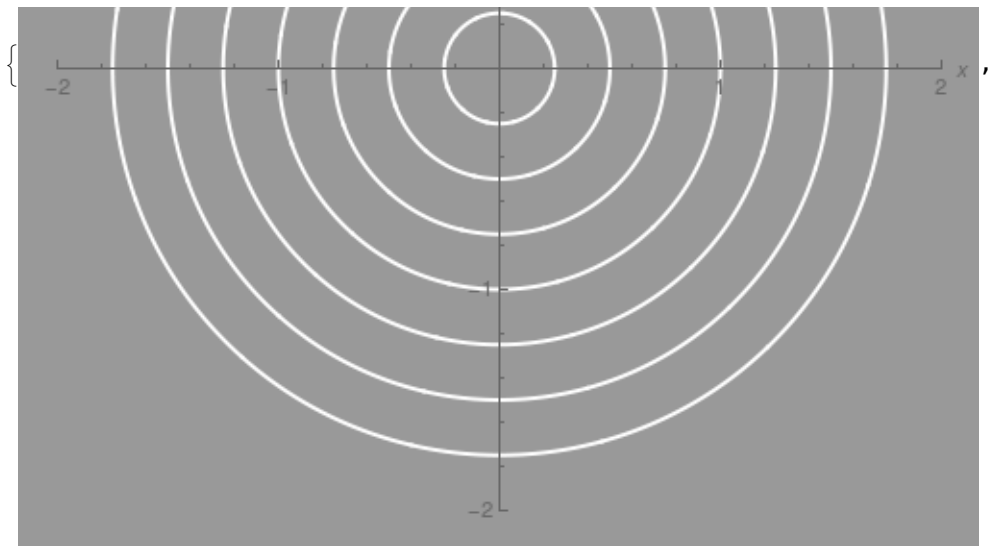
```
makeImage[pts_, expr_, pltRange1_, PltRange2_] := Module[{},
{
  Rasterize@Graphics[{White, Thick, Line[#&/@pts]},
    PlotRange → {{-pltRange1, pltRange1}, {-pltRange1, pltRange1}},
    Axes → True, Background → GrayLevel[.6], ImageSize → {500, 500},
    AxesLabel → {Style["x", Italic], Style["y", Italic]}, ImagePadding → 20],

  Rasterize@Graphics[{White, Thick, Line[{Re[expr /. z → #[[1]] + i#[[2]]],
    Im[expr /. z → #[[1]] + i#[[2]]]} & /@ #&/@pts]},
    PlotRange → {{-PltRange2, PltRange2}, {-PltRange2, PltRange2}},
    Axes → True, Background → RGBColor[.7, .5, .5], ImageSize → {500, 500},
    AxesLabel → {Style["u", Italic], Style["v", Italic]}, ImagePadding → 20]
}
]
```

First we will plot expanding circles from .25 to 1.75 with steps of .25 for  $f = (z+1)(z-.5)(z-1.5I)$

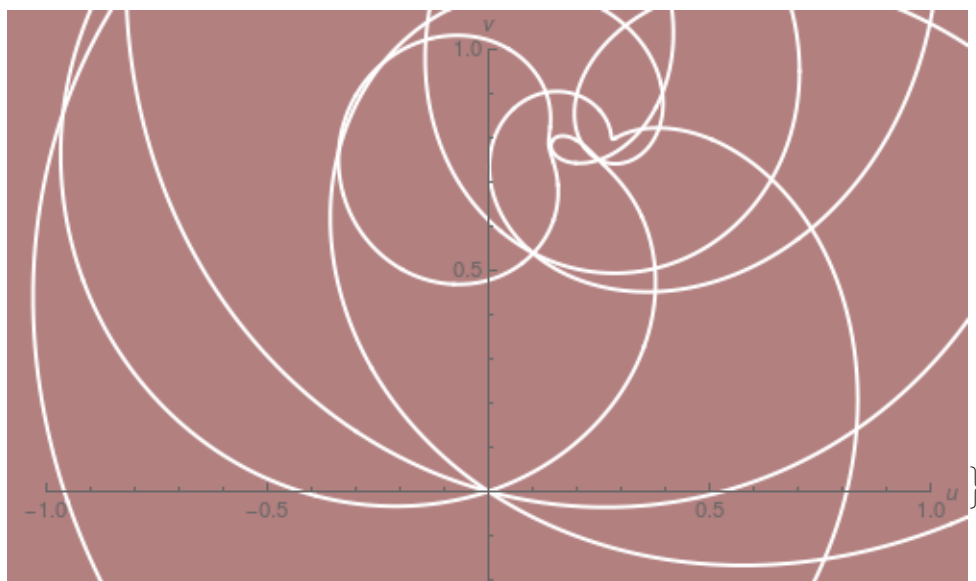
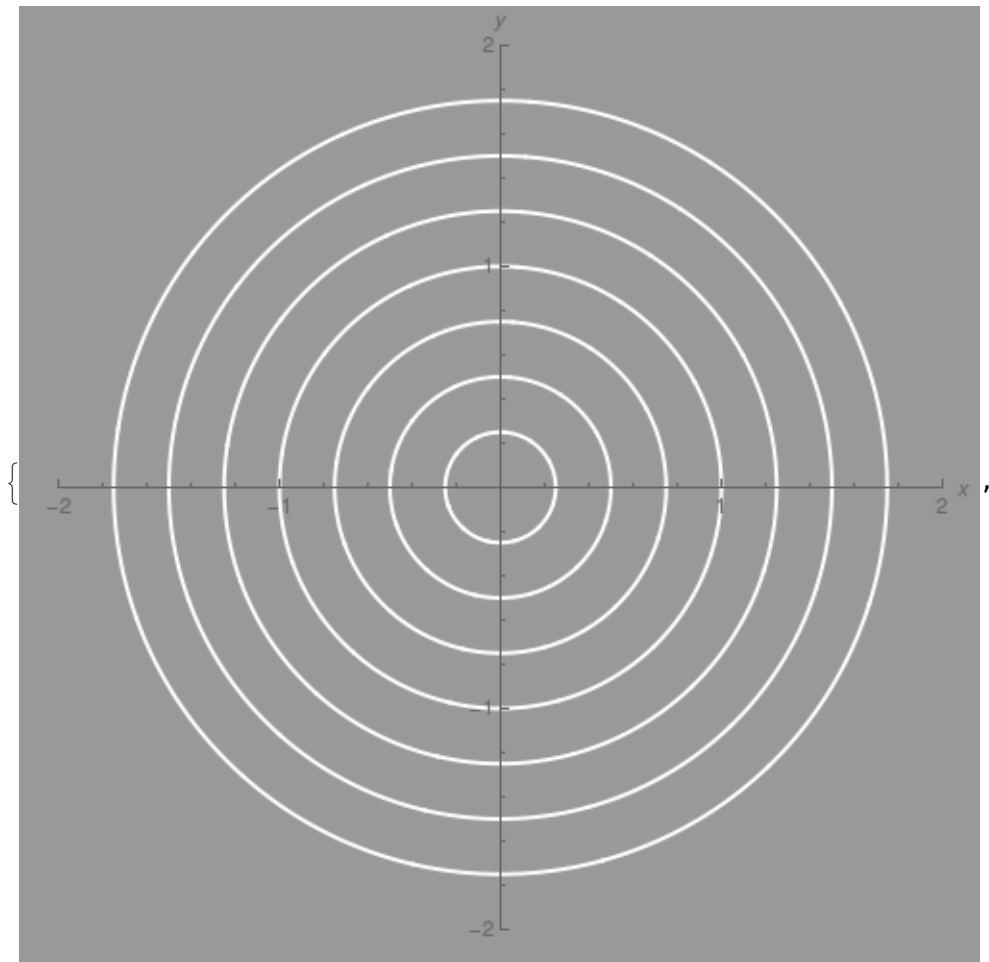
```
expr = (z + 1) (z - .5) (z - 1.5 I);
ang = Range[0 Pi, 2 Pi, .001];
lists = Table[{r Cos[ang], r Sin[ang]}, {r, Range[.25, 1.75, .25]};
pts = Transpose[#] &/@ lists;
n = 2;
m = 11;
makeImage[pts, expr, n, m]
```

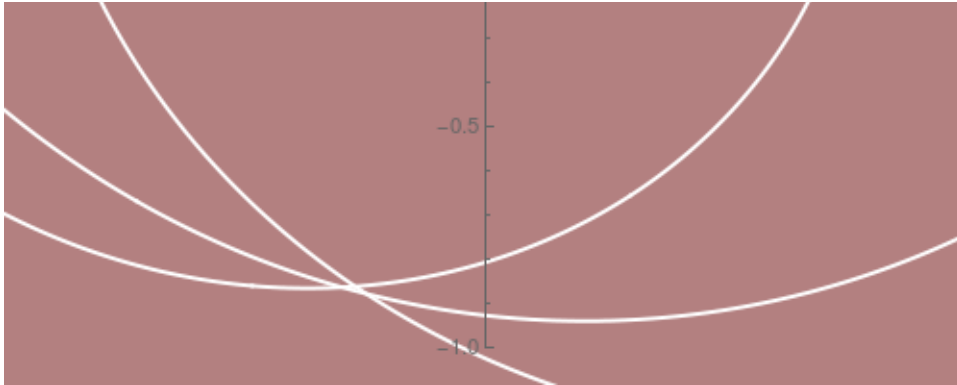




Plot the same range but zoom in on the image

```
n = 2;  
m = 1;  
makeImage[pts, expr, n, m]
```



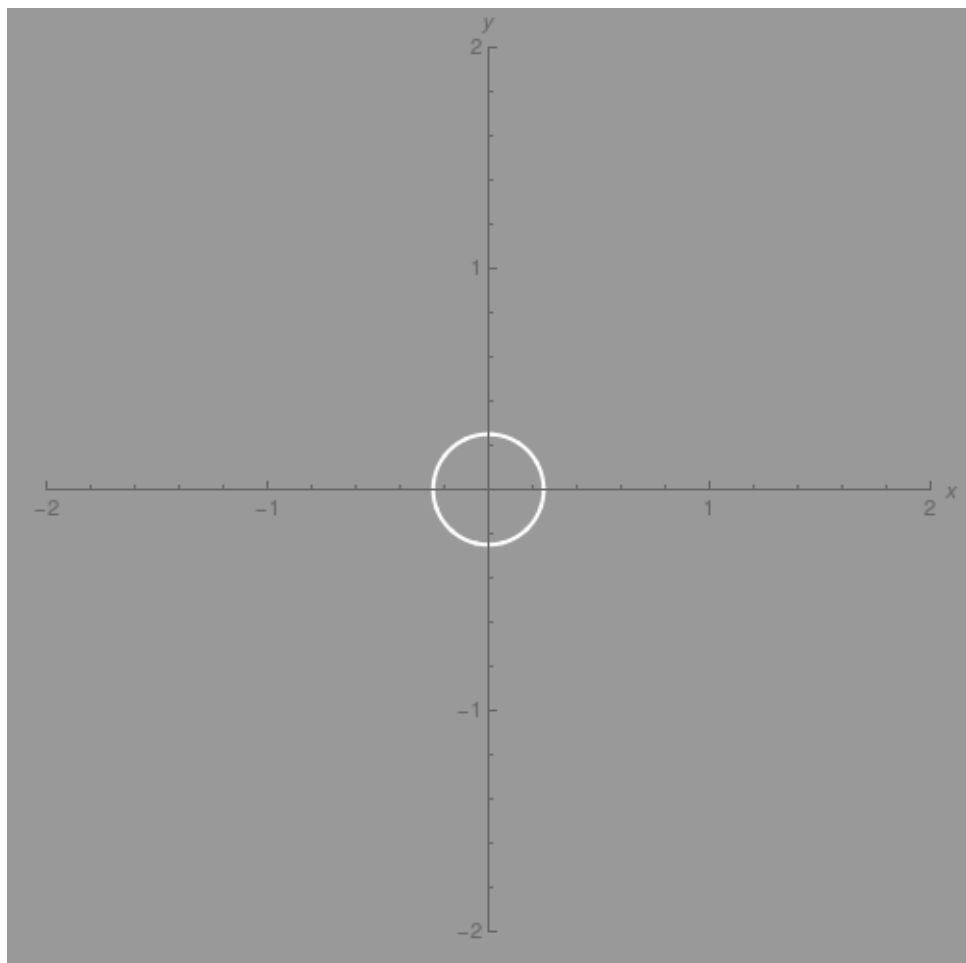


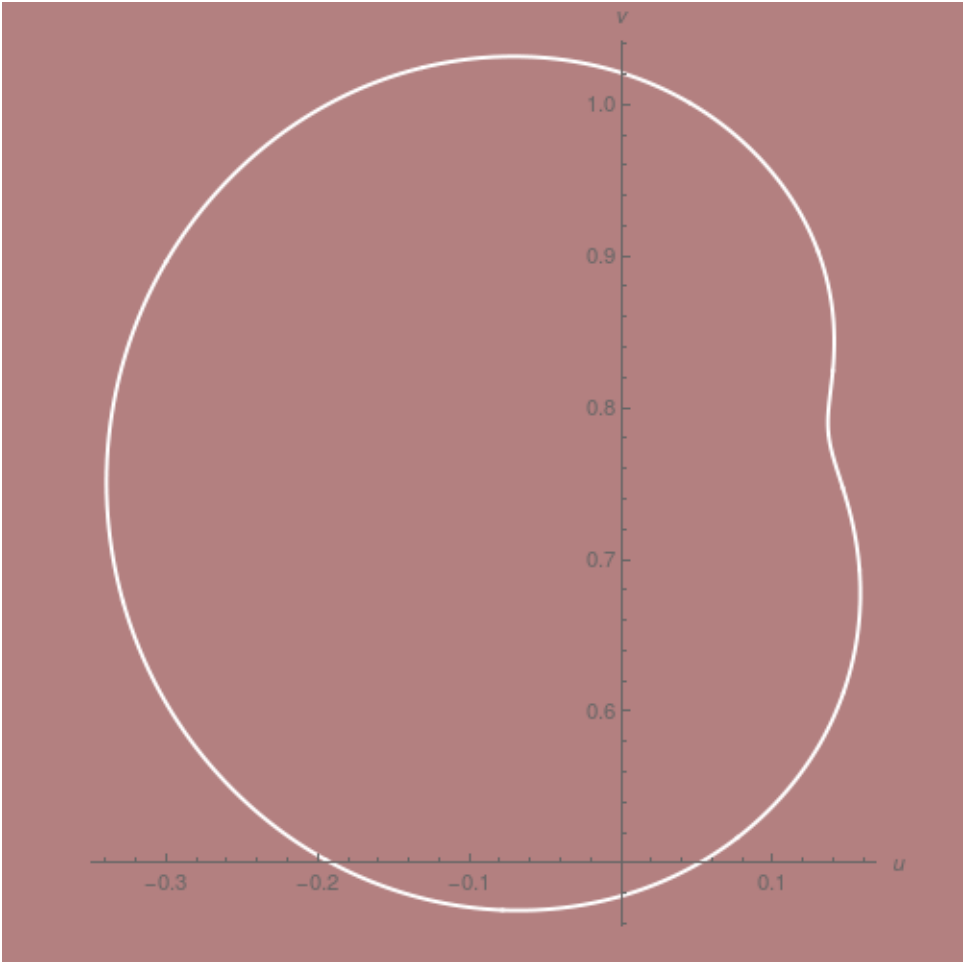
Now, let's plot a few circles individually so we can see what is going on. To do this, we need to dynamically resize the plot range.

```
makeImage2[pts_, expr_, pltRange1_] := Module[{},
{
  Rasterize@Graphics[{White, Thick, Line[# & /@ pts]},
    PlotRange → {{-pltRange1, pltRange1}, {-pltRange1, pltRange1}},
    Axes → True, Background → GrayLevel[.6], ImageSize → {500, 500},
    AxesLabel → {Style["x", Italic], Style["y", Italic]}, ImagePadding → 20],

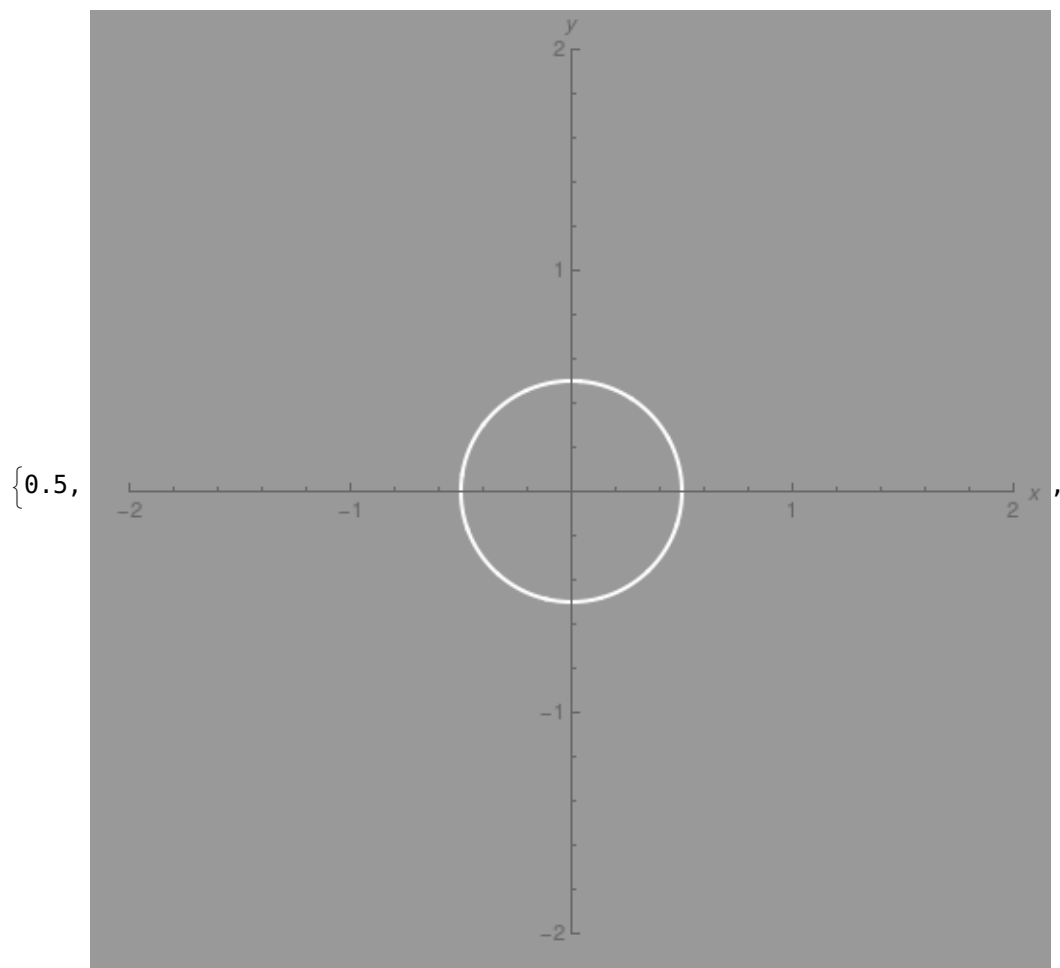
  Rasterize@Graphics[{White, Thick,
    Line[{Re[expr /. z → #[[1]] + i#[[2]], Im[expr /. z → #[[1]] + i#[[2]]]} & /@
      # & /@ pts]}, PlotRange → All, Axes → True,
    Background → RGBColor[.7, .5, .5], ImageSize → {500, 500},
    AxesLabel → {Style["u", Italic], Style["v", Italic]}, ImagePadding → 20]
}
]

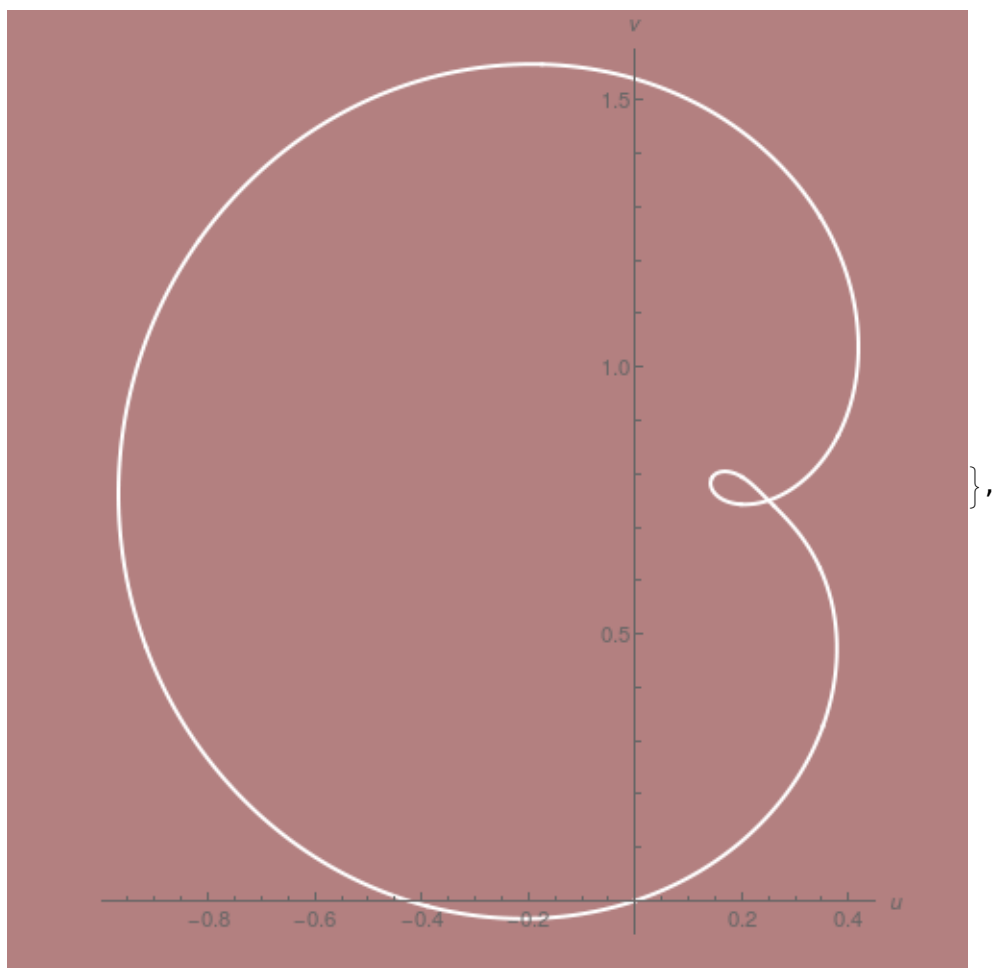
Table[lists = Table[{r Cos[ang], r Sin[ang]}, {r, {x}}];
pts = Transpose[#] & /@ lists;
n = 2;
Flatten[{x, makeImage2[pts, expr, n]}, {x, Range[.25, 1.75, .25]}]
```

$\{0.25,$ 

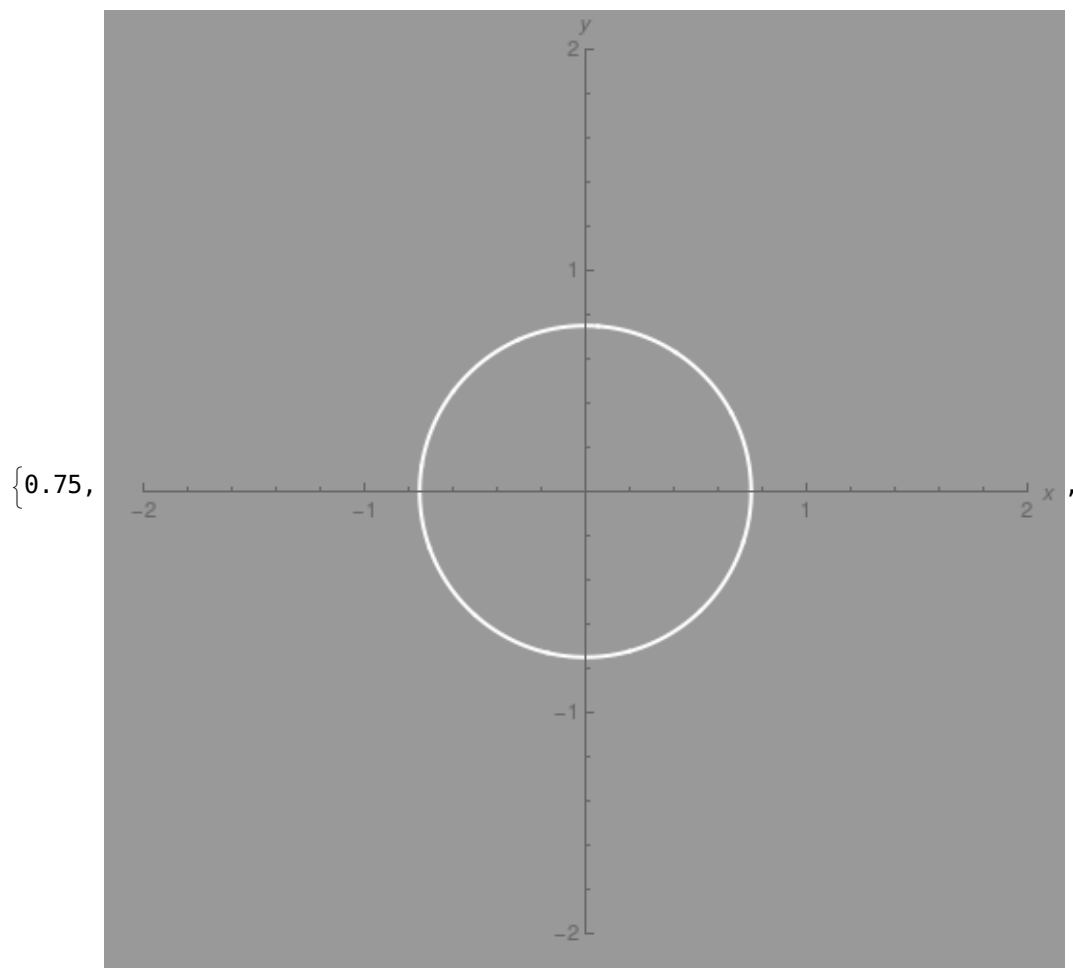


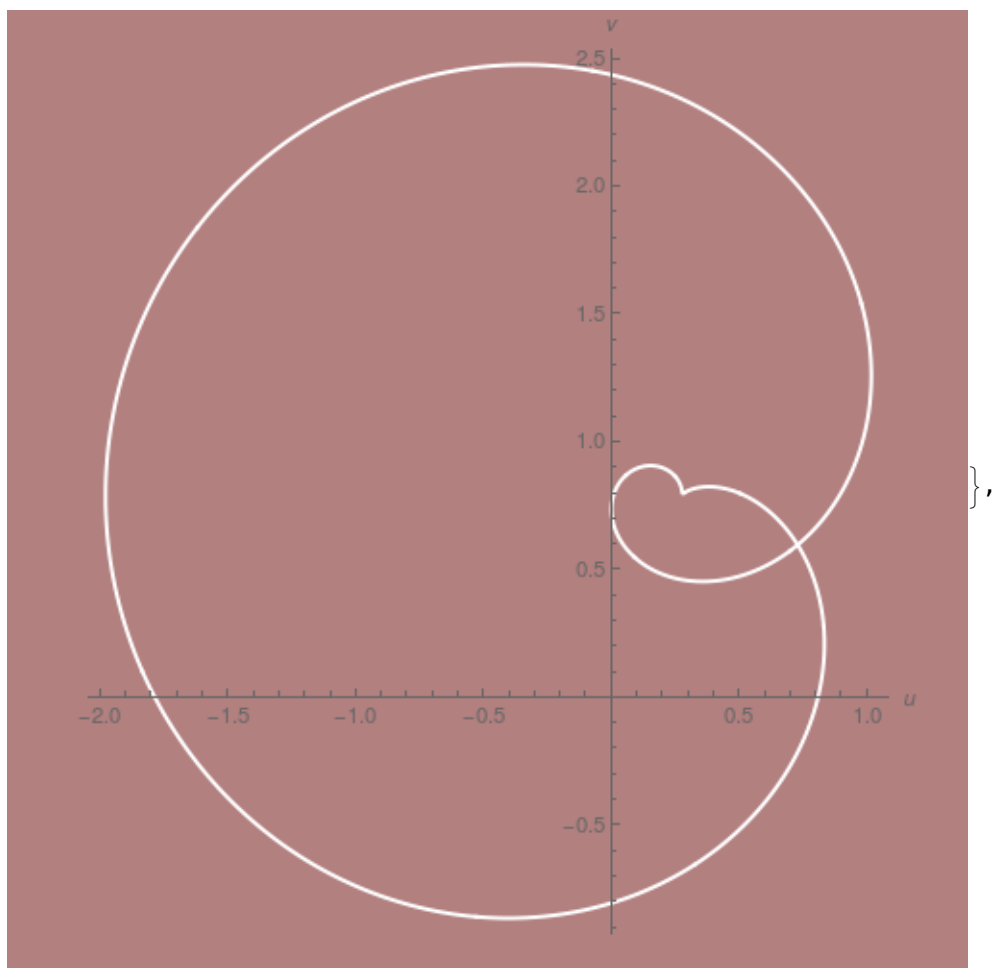
}

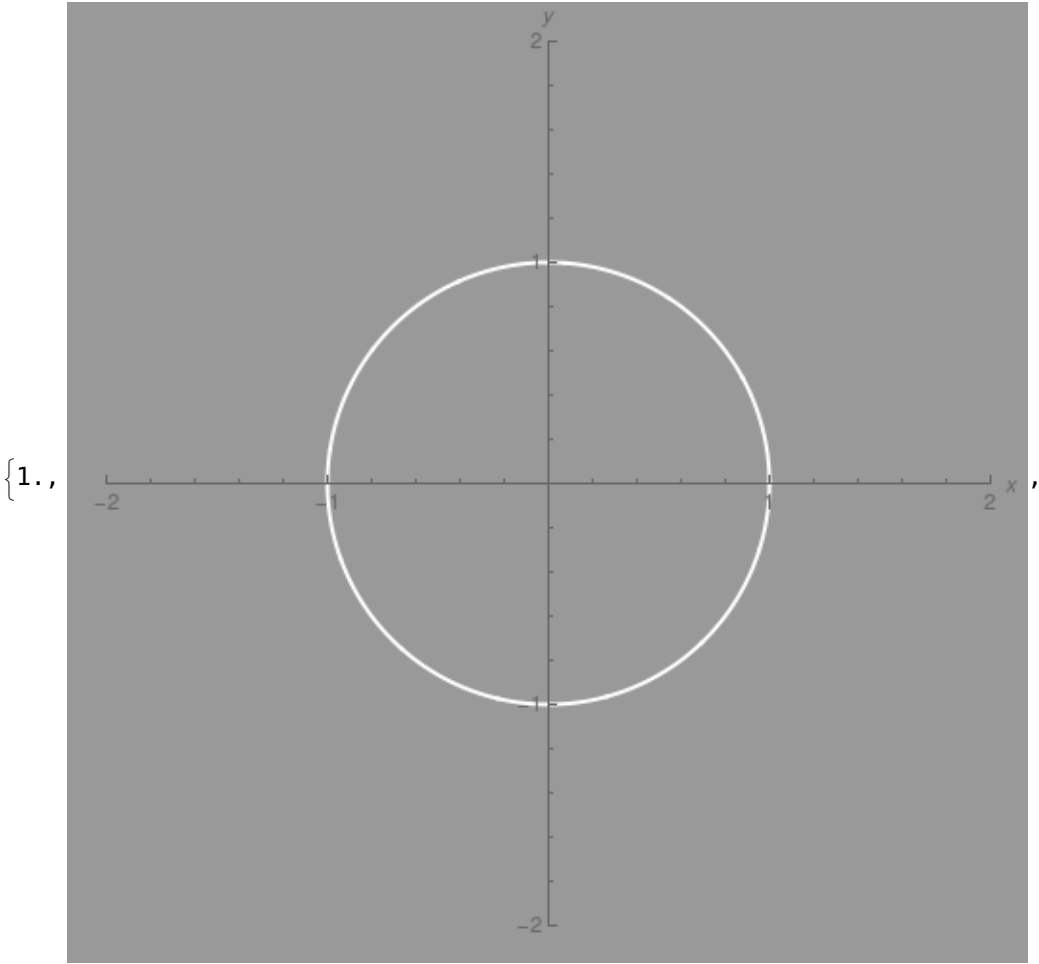












{1.,

