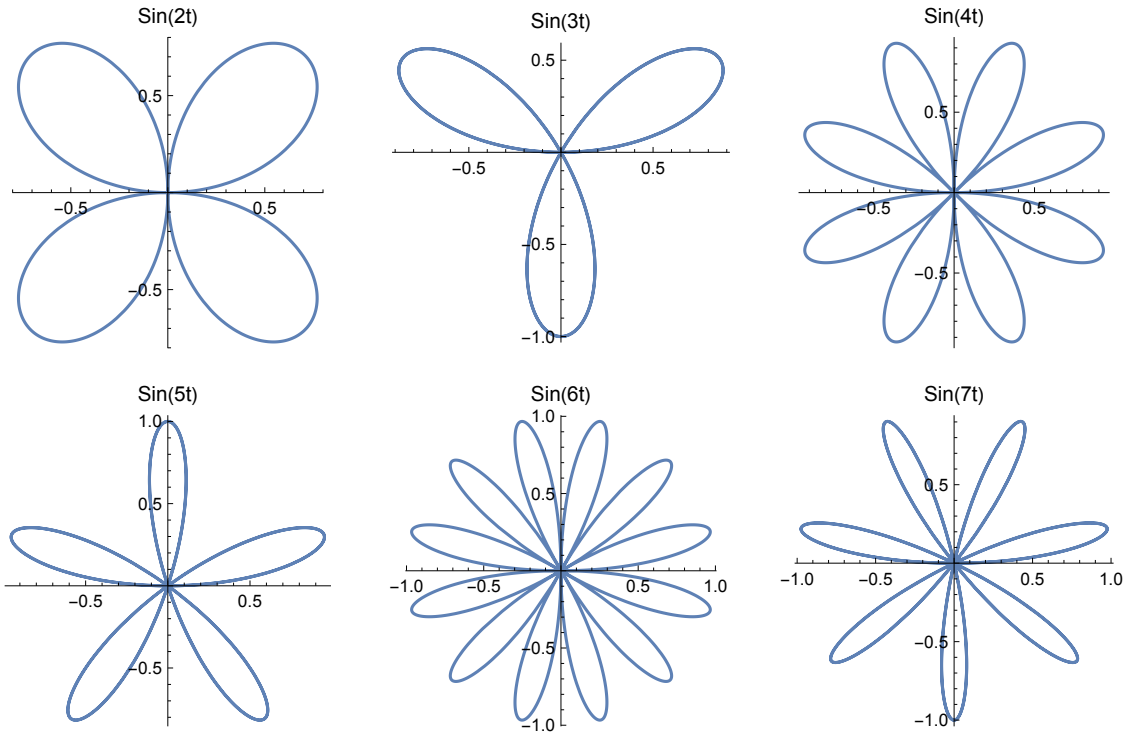
Question 1:

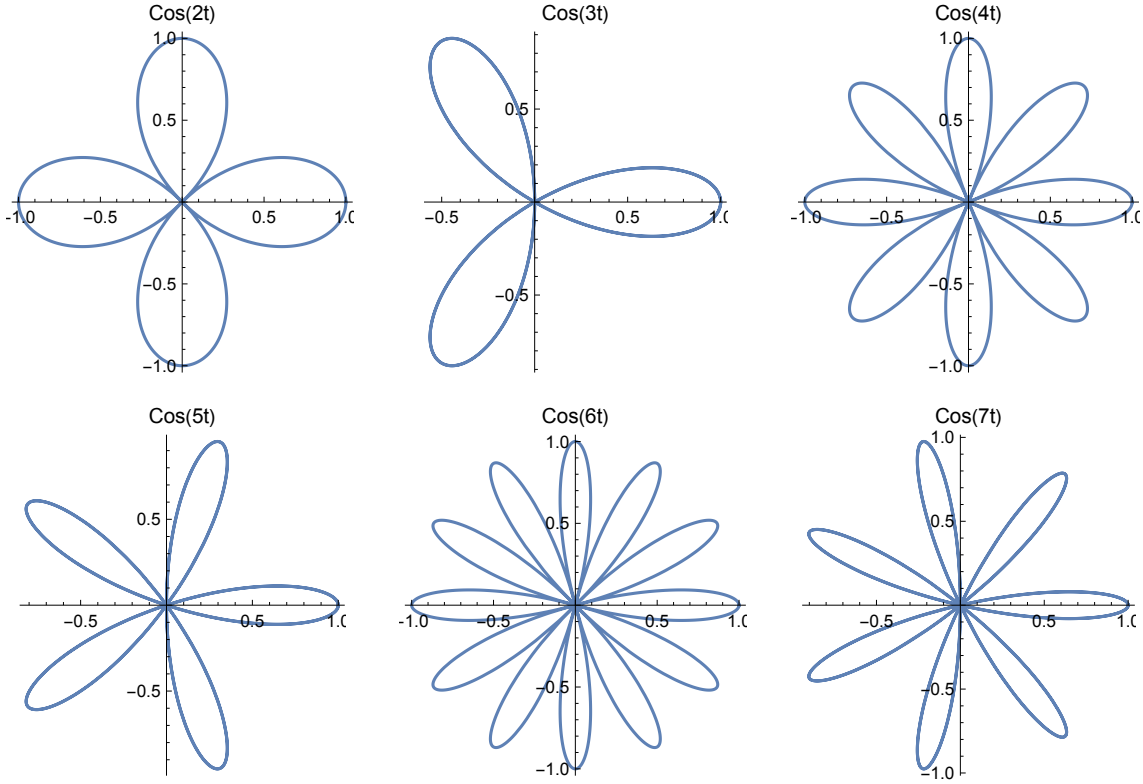
In[7]:=

```
GraphicsGrid[{
{PolarPlot[Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(2t)"]],
PolarPlot[Sin[3t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(3t)"]],
PolarPlot[Sin[4t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(4t)"]]
},
{PolarPlot[Sin[5t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(5t)"]],
PolarPlot[Sin[6t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(6t)"]],
PolarPlot[Sin[7t], {t, 0, 2Pi}, PlotLabel→ Style["Sin(7t)"]]}

}]
GraphicsGrid[{
{PolarPlot[Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(2t)"]],
PolarPlot[Cos[3t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(3t)"]],
PolarPlot[Cos[4t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(4t)"]]
},
{PolarPlot[Cos[5t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(5t)"]],
PolarPlot[Cos[6t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(6t)"]],
PolarPlot[Cos[7t], {t, 0, 2Pi}, PlotLabel→ Style["Cos(7t)"]]}

}]
```

Out[7]=



Out[8]=



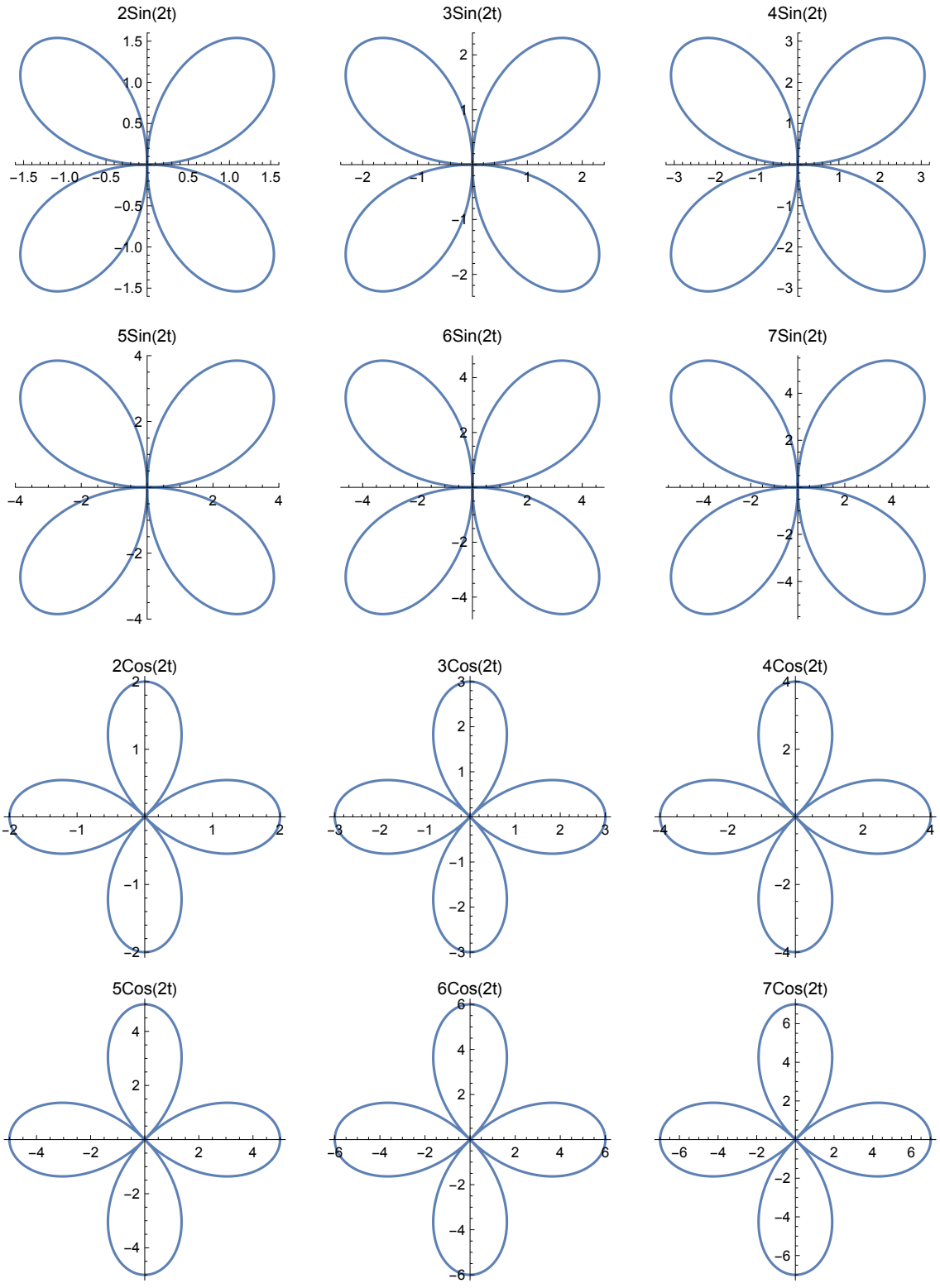
It seems like the pattern is that there are 2b petals/loops when b is even, and b petals when b is odd. There certainly is an increase in loops/petals as b increases. This makes sense, since we oscillate more frequency with these periodic functions as we decrease the period. Cosine seems to have petals along

the y-axis when b is even and sine does not have petals along the y-axis when b is even. Cosine is also just a rotated version of Sine for each b (and vice versa).

Question 2:

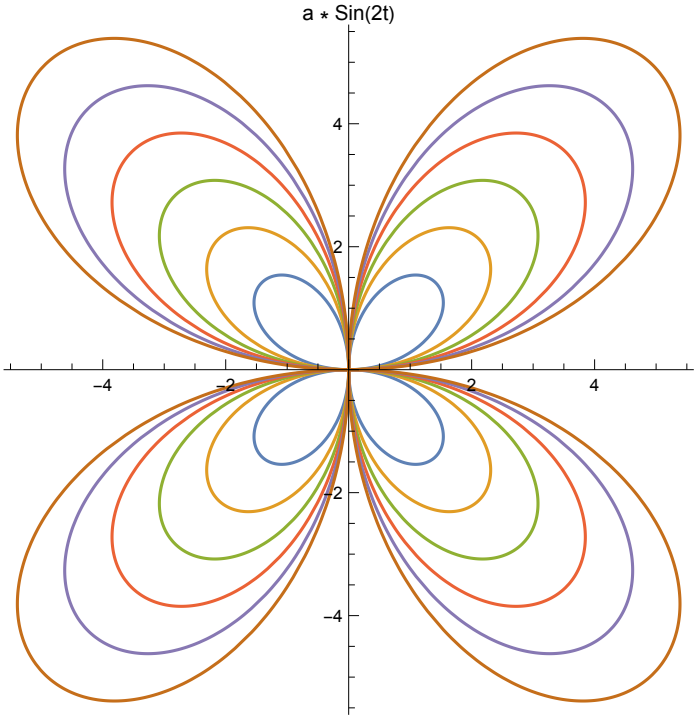
```
GraphicsGrid[{
{PolarPlot[2*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["2Sin(2t)"]],
PolarPlot[3*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["3Sin(2t)"]],
PolarPlot[4*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["4Sin(2t)"]]
},
{PolarPlot[5*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["5Sin(2t)"]],
PolarPlot[6*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["6Sin(2t)"]],
PolarPlot[7*Sin[2t], {t, 0, 2Pi}, PlotLabel→ Style["7Sin(2t)"]]}

}]
GraphicsGrid[{
{PolarPlot[2*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["2Cos(2t)"]],
PolarPlot[3*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["3Cos(2t)"]],
PolarPlot[4*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["4Cos(2t)"]]
},
{PolarPlot[5*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["5Cos(2t)"]],
PolarPlot[6*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["6Cos(2t)"]],
PolarPlot[7*Cos[2t], {t, 0, 2Pi}, PlotLabel→ Style["7Cos(2t)"]]}

}]
```

Out[24]=

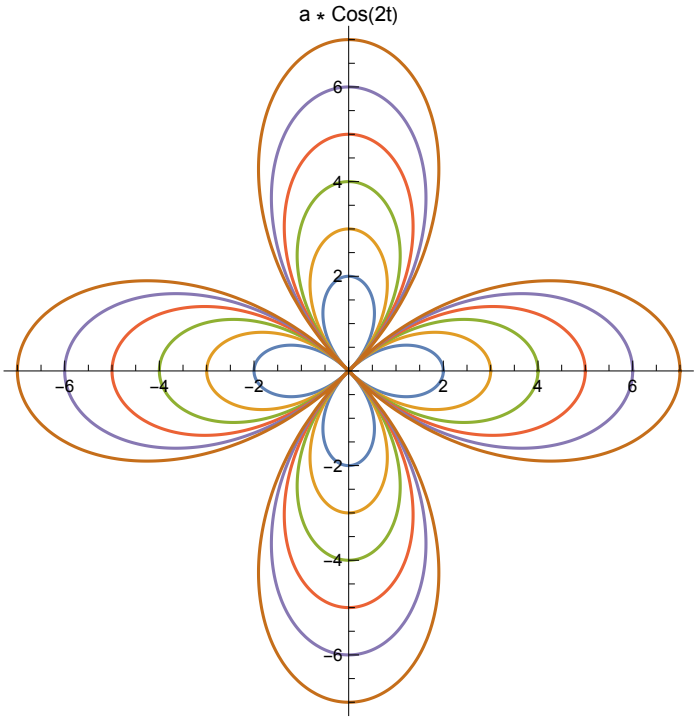

2Sin(2t)
3Sin(2t)
4Sin(2t)
5Sin(2t)
6Sin(2t)
7Sin(2t)
2Cos(2t)
3Cos(2t)
4Cos(2t)
5Cos(2t)
6Cos(2t)
7Cos(2t)

In[30]:=
```
PolarPlot[Evaluate[Flatten[Table[{a*Sin[2*t]}, {a, 2, 7, 1}]]], {t, 0, 2Pi}, PlotLabel→ S
PolarPlot[Evaluate[Flatten[Table[{a*Cos[2*t]}, {a, 2, 7, 1}]]], {t, 0, 2Pi}, PlotLabel→ S
```

Out[30]=



Out[31]=



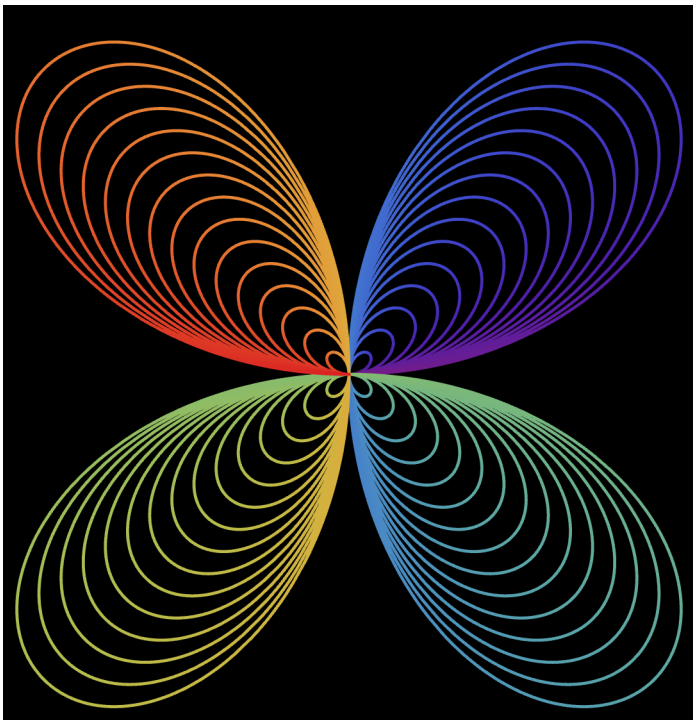
As a increases, the petals go out farther. Specifically, they go out by a factor of a. This makes sense, since the sine and cosine functions oscillate between -1 and 1, so a is just scaling these functions. It's

not as clear in the first tables of graphs, since they automatically scale the axis. However, in the overlapping image, it's easy to see that as a increases, we get larger and larger petals. They all have the same frequency though!

Question 3:

In[44]:=
```
PolarPlot[Evaluate[Flatten[Table[{a*Sin[2*t]}, {a, 1, 15, 1}]]], {t, 0, 2Pi}, PlotLabel→
PolarPlot[Evaluate[Flatten[Table[{a*Cos[2*t]}, {a, 1, 15, 1}]]], {t, 0, 2Pi}, PlotLabel→
```

Out[44]=



Out[45]=