Problem 5

For some reason Manipulate would not produce a picture, so different cases of E (one for each orbital outcome) will be plotted.

$$r = \frac{\left(\frac{l^2}{\mu k}\right)}{1 + \left(\sqrt{\left(1 + \frac{(2\,e\,l^2)}{\mu k}\right)}\right) Cos[\theta]} \;;$$
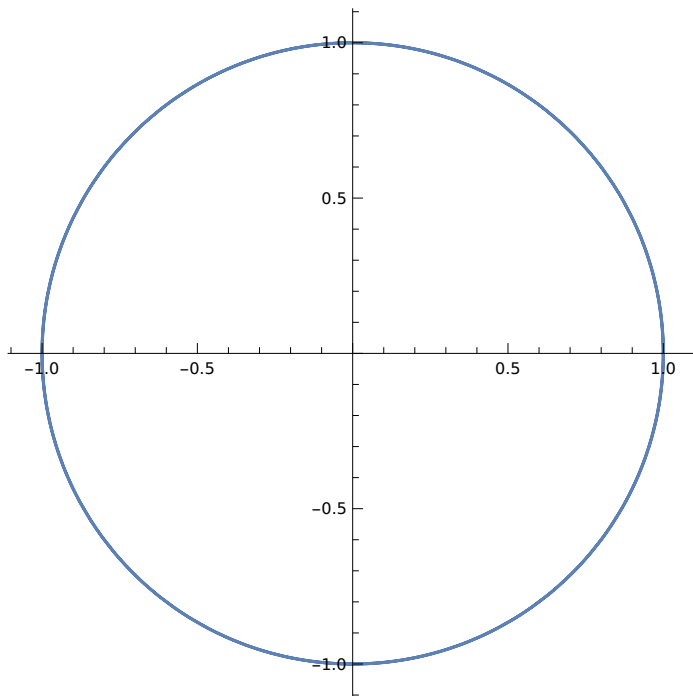
```
e = -.5;
μ = 1;
l = 1;
k = 1;
ParametricPlot[{r Cos[θ], r Sin[θ]}, {θ, 0, 4 π}]
```
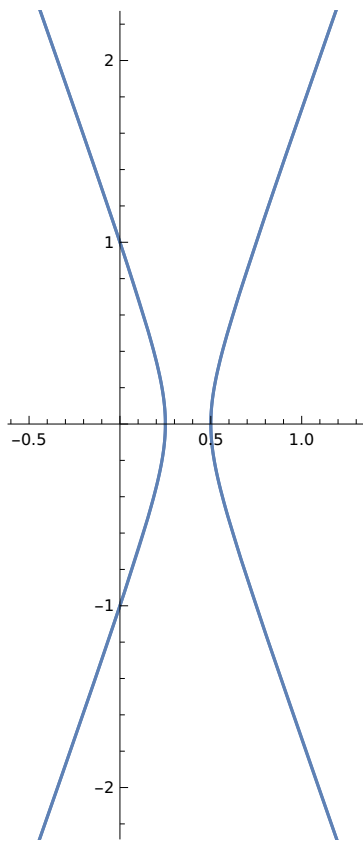
Case 1: Circle $\epsilon = 0$


```
Clear[e]
```

```
e = 4;
ParametricPlot[{r Cos[θ], r Sin[θ]}, {θ, 0, 4 π}]
```
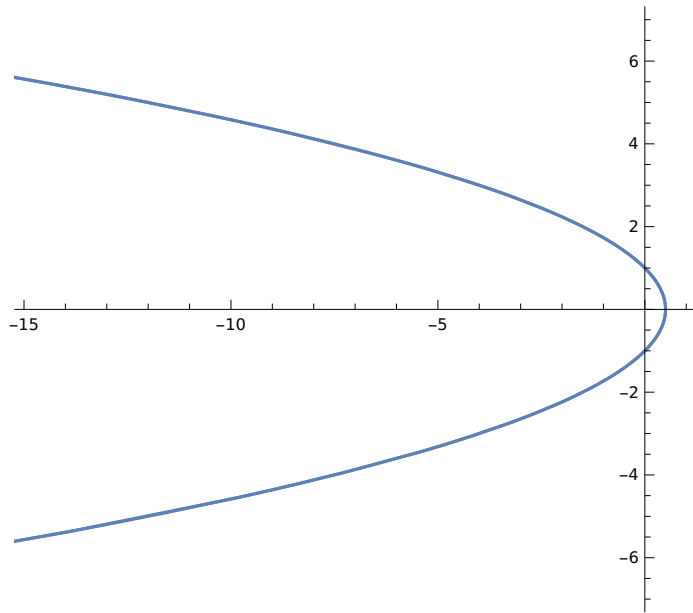
Case 2: Hyperbola $\epsilon > 1$


```
Clear[e]
```

```
e = 0;
ParametricPlot[{r Cos[θ], r Sin[θ]}, {θ, 0, 4 π}]
```

Case 3: Parabola $\epsilon = 1$

```
Clear[e]
```

```
e = -.1;
ParametricPlot[{r Cos[θ], r Sin[θ]}, {θ, 0, 4 π}]
```

Case 4: Ellipse $0 < \epsilon < 1$