V (r) = k*r^(n + 1)

```
v[u_] := k / u ^ (n + 1)
```

```
k = -10
```

$$-10$$

```
l = 3
```

$$3$$

```
mu = 1
```

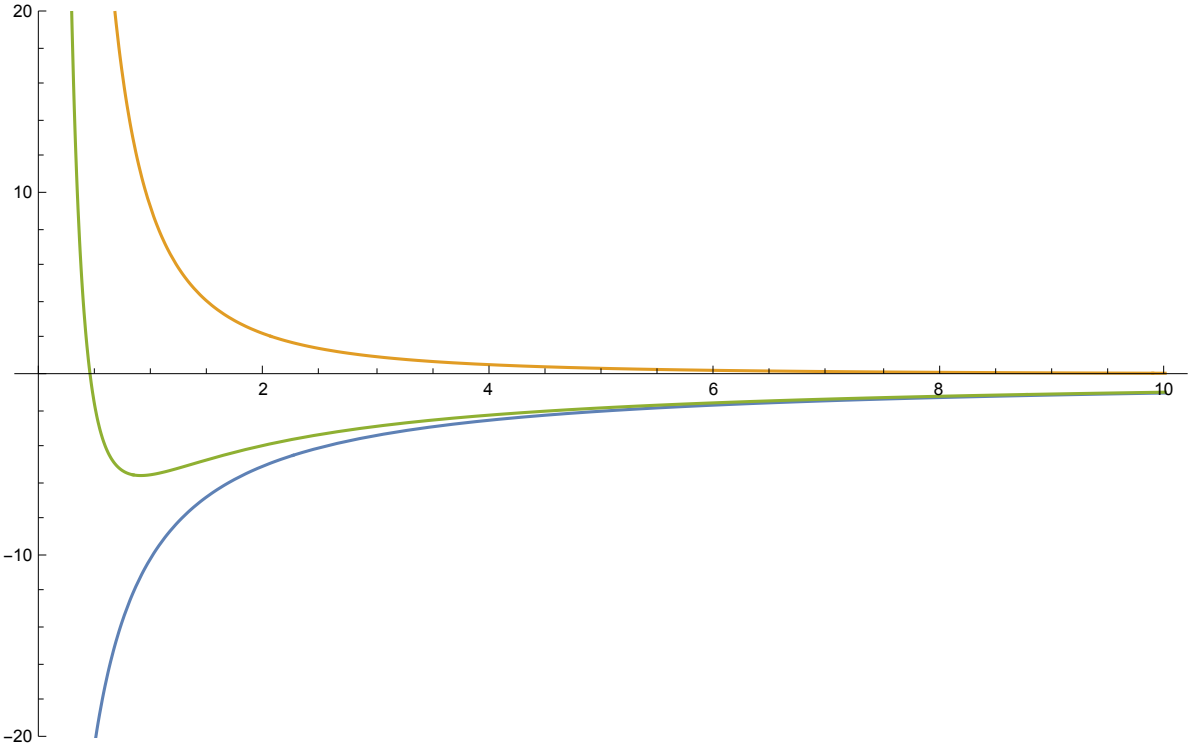
$$1$$

```
n = -2
```

$$-2$$

```
fakev[u_] := l ^ 2 / 2 / mu * u ^ 2 + v[u]
```

```
Plot[{v[1 / r], l ^ 2 / mu / r ^ 2, fakev[1 / r]}, {r, 0, 10}, PlotRange → {-20, 20}]
```




```
uequi = Solve[fakev'[uu] == 0, uu]
```

$$\left\{\left\{uu \to \frac{10}{9}\right\}\right\}$$

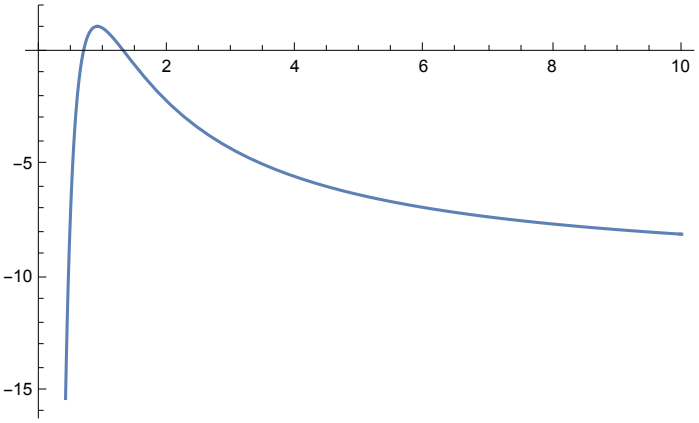
```
fakev[uu] /. uequi
```

$$\left\{-\frac{50}{9}\right\}$$

```
e = -5
```

```
-5
```

```
Plot[2 * mu * e - l^2 / r^2 - 2 * mu * v[1 / r], {r, 0, 10}]
```




```
utp = NSolve[2 * mu * e - l^2 / r^2 - 2 * mu * v[1 / r] == 0, r, Reals]
```

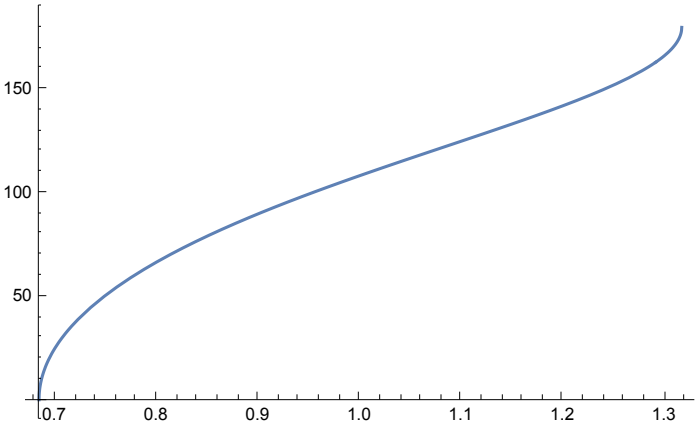
```
{{r → 0.683772}, {r → 1.31623}}
```

```
theta[rmax_] := l * Integrate[
   1 / Sqrt[2 * mu * e - l^2 * uu^2 - 2 * mu * v[uu]], {uu, 1 / rmax, 1 / 0.683772233983163}]
```

```
theta[1] * 180 / Pi
```

```
108.435
```

```
Plot[180 / Pi * theta[rm], {rm, 0.683772233983163, 1.316227766016837}]
```



```
ParametricPlot[{{rm * Cos[theta[rm]], rm * Sin[theta[rm]]},
  {rm * Cos[-theta[rm]], rm * Sin[-theta[rm]]}},
 {rm, 0.683772233983163, 1.316227766016837}]
```