In[16]:=
```
x = r[t] Cos[ϕ[t]];
y = r[t] Sin[ϕ[t]];
rp = μ r[t] (1 - r[t]^2) ;
xp = D[x, t] /. {r'[t] → rp, ϕ'[t] → 1} // Simplify
yp = D[y, t] /. {r'[t] → rp, ϕ'[t] → 1} // Simplify
```

Out[19]= $r[t]\,\left(-\mu\, \mathrm{Cos}[\phi[t]]\,\left(-1+r[t]^2\right)-\mathrm{Sin}[\phi[t]]\right)$

Out[20]= $r[t]\,\left(\mathrm{Cos}[\phi[t]]-\mu\,\left(-1+r[t]^2\right)\mathrm{Sin}[\phi[t]]\right)$

In[21]:=
```
(* Igy neznek ki xx-yy KR.ben az egyenletek*)
xxp = xp /. {r[t] → Sqrt[xx^2 + yy^2], ϕ[t] → ArcTan[xx, yy]} // FullSimplify
yyp = yp /. {r[t] → Sqrt[xx^2 + yy^2], ϕ[t] → ArcTan[xx, yy]} // FullSimplify
Simplify[xxp /. {xx → Cos[t], yy → Sin[t]}]
Simplify[yyp /. {xx → Cos[t], yy → Sin[t]}]
```

Out[21]= $-yy-xx\,\left(-1+xx^2+yy^2\right)\,\mu$

Out[22]= $xx-yy\,\left(-1+xx^2+yy^2\right)\,\mu$

Out[23]= $-\mathrm{Sin}[t]$

Out[24]= $\mathrm{Cos}[t]$

In[48]:=
```
Jac = FullSimplify[( D[xxp, xx]  D[xxp, yy]
                     D[yyp, xx]  D[yyp, yy] )];
MatrixForm[Jac]
M = Exp[Jac t /. {xx → Cos[t], yy → Sin[t]} /. {t → 2 π}] // Simplify;
MatrixForm[M]
```

Out[49]//MatrixForm=

$$\begin{pmatrix} -\left(-1+3\,xx^2+yy^2\right)\mu & -1-2\,xx\,yy\,\mu \\ 1-2\,xx\,yy\,\mu & -\left(-1+xx^2+3\,yy^2\right)\mu \end{pmatrix}$$

Out[51]//MatrixForm=

$$\begin{pmatrix} e^{-4\pi\mu} & e^{-2\pi} \\ e^{2\pi} & 1 \end{pmatrix}$$

In[61]:=
```
DSolve[{D[rr[t], t] == μ rr[t] (1 - rr[t]^2), rr[0] == r0}, rr[t], t]
```

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Solve: Inverse functions are being used by Solve, so some solutions may not be found; use Reduce for complete solution information.

Out[61]= $\left\{\left\{rr[t]\to-\frac{e^{t\mu}}{\sqrt{-1+e^{2t\mu}+\frac{1}{r0^2}}}\right\},\left\{rr[t]\to\frac{e^{t\mu}}{\sqrt{-1+e^{2t\mu}+\frac{1}{r0^2}}}\right\}\right\}$

In[63]:=
```
FullSimplify[D[e^(t μ)/Sqrt[-1 + e^(2 t μ) + 1/r0^2], r0] /. {r0 → 1} /. {t → 2 π},
 Assumptions → {Im[μ] == 0}]
```

Out[63]= $e^{-4\pi\mu}$