HIPERBOLA
Obtencion de posicion y velocidad a aprtir de elementos orbitales.
Curso Mecanica Celeste 2005. Tabare Gallardo.

unidad de tiempo = dia
unidad de distancia = ua
unidad de masa = sol

```
M := 1.0
m := 0.0009548
kgauss := 0.01720209895
μ := kgauss * kgauss * (M + m)
a := -5.179995814935037
e := 1.04871959170445102
i := 1.3046833201072958 * Pi / 180
ω := -84.90588389067327 * Pi / 180
Ω := 100.48313071118518 * Pi / 180
T := -81.299453540603
t := -82.0
```

```
kepler[tt_, ϵ_, mm_] := Module[{lista = {}, ee = tt},
  For[j = 1, j ≤ mm, j++, ee = ArcSinh[(tt + ee)/ϵ];
   lista = Append[lista, ee]]; Return[lista]]
```

$$n := \sqrt{\frac{-\mu}{a^3}}$$

```
p := a * (1 - e * e)
h := √(p * μ)
```

```
AM := n * (t - T)
```

```
iteraciones := 500
```

```
F1 = Last[kepler[AM, e, iteraciones - 1]]
```

```
-0.0209577
```

```
F = Last[kepler[AM, e, iteraciones]]
```

```
-0.0209577
```

```
r = a * (1 - e * Cosh[F])
```

```
0.25356
```

```
θ = Sign[t - T] * ArcCos[(p / r - 1) / e]
```

```
-0.135691
```

```
{r, θ}
```

```
{0.25356, -0.135691}
```

```
ξ := r * Cos[θ]
η := r * Sin[θ]
ζ := 0
```

```
vecpos := {ξ, η, ζ}
```

```
xp := -h / p * Sin[θ]
yp := h / p * (e + Cos[θ])
zp := 0
```

```
vecvel := {xp, yp, zp}
```

```
P1={{Cos[ω],-Sin[ω],0},{Sin[ω],Cos[ω],0},{0,0,1}};
```

```
P2={{1,0,0},{0,Cos[i],-Sin[i]},{0,Sin[i],Cos[i]}};
```

```
P3={{Cos[Ω],-Sin[Ω],0},{Sin[Ω],Cos[Ω],0},{0,0,1}};
```

```
P=P3.P2.P1;
```

```
veclipos = P.vecpos
```

```
{0.251148, 0.0344121, -0.00576701}
```

```
veclivel = P.vecvel
```

```
{-0.00998973, 0.0478923, 0.0000252613}
```