

```

> restart:
theta2(t);
theta3(t);
PG2x(t) := r2 * sin(theta2(t));
PG2y(t) := - r2 * cos(theta2(t));
VG2x(t) := diff(PG2x(t),t);
VG2y(t) := diff(PG2y(t),t);
AG2x(t) := diff(VG2x(t),t);
AG2y(t) := diff(VG2y(t),t);

```

$$\theta_2(t)$$

$$\theta_3(t)$$

$$PG2x(t) := r2 \sin(\theta_2(t))$$

$$PG2y(t) := -r2 \cos(\theta_2(t))$$

$$VG2x(t) := r2 \cos(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)$$

$$VG2y(t) := r2 \sin(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)$$

$$AG2x(t) := -r2 \sin(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)^2 + r2 \cos(\theta_2(t)) \left(\frac{d^2}{dt^2} \theta_2(t) \right)$$

$$AG2y(t) := r2 \cos(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)^2 + r2 \sin(\theta_2(t)) \left(\frac{d^2}{dt^2} \theta_2(t) \right)$$

```

> eq1:= R12x = m2 * AG2x(t);
eq2 := R12y - m2 * g = m2 * AG2y(t);
eq3 := - R12y*r2*sin(theta2(t)) - r2*R12x*cos(theta2(t)) = IG2 *
diff(diff(theta2(t),t),t);

```

$$eq1 := R12x = m2 \left(-r2 \sin(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)^2 + r2 \cos(\theta_2(t)) \left(\frac{d^2}{dt^2} \theta_2(t) \right) \right)$$

$$eq2 := R12y - m2g = m2 \left(r2 \cos(\theta_2(t)) \left(\frac{d}{dt} \theta_2(t) \right)^2 + r2 \sin(\theta_2(t)) \left(\frac{d^2}{dt^2} \theta_2(t) \right) \right)$$

$$eq3 := -R12y r2 \sin(\theta2(t)) - r2 R12x \cos(\theta2(t)) = IG2 \left(\frac{d^2}{dt^2} \theta2(t) \right)$$

```
> sostituzioni := {diff(theta2(t),t$2)=(t2_i2 - 2*t2_i1 +
t2_i)/(delta_t^2),diff(theta2(t),t)=(t2_i1 - t2_i)/delta_t, theta2(t) =
theta2 };
equaz1 := subs(sostituzioni,eq1);
equaz2 := subs(sostituzioni,eq2);
equaz3 := subs(sostituzioni,eq3);
```

$$sostituzioni = \left\{ \frac{d^2}{dt^2} \theta2(t) = \frac{t2_i2 - 2 t2_i1 + t2_i}{\delta t^2}, \frac{d}{dt} \theta2(t) = \frac{t2_i1 - t2_i}{\delta t}, \theta2(t) = \theta2 \right\}$$

$$equaz1 = R12x = m2 \left(- \frac{r2 \sin(\theta2) (t2_i1 - t2_i)^2}{\delta t^2} + \frac{r2 \cos(\theta2) (t2_i2 - 2 t2_i1 + t2_i)}{\delta t^2} \right)$$

$$equaz2 = R12y - m2 g = m2 \left(\frac{r2 \cos(\theta2) (t2_i1 - t2_i)^2}{\delta t^2} + \frac{r2 \sin(\theta2) (t2_i2 - 2 t2_i1 + t2_i)}{\delta t^2} \right)$$

$$equaz3 = -R12y r2 \sin(\theta2) - r2 R12x \cos(\theta2) = \frac{IG2 (t2_i2 - 2 t2_i1 + t2_i)}{\delta t^2}$$

```
> sistema := {equaz1,equaz2,equaz3};
variabili := {R12x,R12y,t2_i2,t3_i2};
soluzione:=solve(sistema,variabili);
```

```
> theta2 := t2_i;
assign(soluzione);
```

$$\theta2 := t2_i$$

```
> factor(t2_i2);
```

$$- \frac{m2 r2 \sin(t2_i) g \delta t^2 - 2 r2^2 m2 t2_i1 + r2^2 m2 t2_i - 2 IG2 t2_i1 + IG2 t2_i}{r2^2 m2 + IG2}$$

```
> IG2 := 0.15;
r2 := 0.3;
l := 0.6;
m2 := 0.480;
g := 9.807;
delta_t := 0.001;
```

$$IG2 := 0.15$$

```
r2 := 0.3  
l := 0.6  
m2:= 0.480  
g := 9.807  
delta_t:= 0.001
```

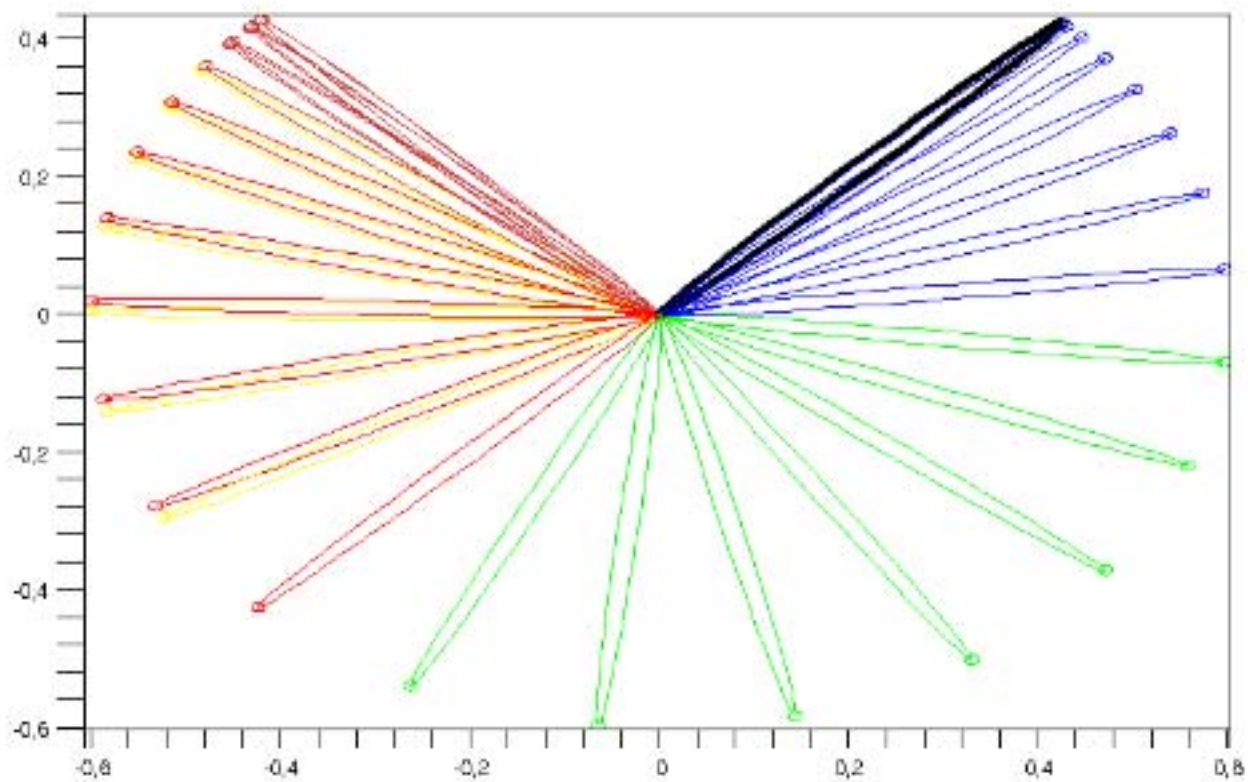
```
> TE2_ini := evalf(135*(Pi/180));  
OM2_ini := evalf(0*(Pi/180));  
TE2_2 := TE2_ini + delta_t * OM2_ini;  
TE2[1] := TE2_ini;  
TE2[2] := TE2_2;  
TE2[3] :=  
eval(t2_i2,{t2_i=TE2_ini,t2_i1=TE2_2,t3_i=TE3_ini,t3_i1=TE3_2});
```

```
TE2_ini:= 2.356194490  
OM2_ini:= 0.  
TE2_2:= 2.356194490  
TE21 := 2.356194490  
TE22 := 2.356194490  
TE23 := 2.356189321
```

```
> inizio := 1;  
intervallo := 10;  
fine := 2500;  
for i from 4 to fine do  
TE2_ini := TE2[i-2];  
TE2_2 := TE2[i-1];  
TE2[i] := eval(t2_i2,{t2_i=TE2_ini,t2_i1=TE2_2});  
end do;
```

```
inizio:= 1  
intervallo:= 10  
fine:= 2500
```

```
> draw(pendoloc);
```



```
> bipendolo;
rag_cer := 0.1;
with(geometry):
point(A,0,0);
point(B,1,1);
assemin:= 3*rag_cer;
```

```
{CERC5(color = blue), asta25(color = blue), asta15(color = blue), CERC39(color = blue),
asta239(color = blue), CERB39(color = blue), asta139(color = blue), CERA CERB5(color = blue),
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asta231(color = blue), asta131(color = blue), CERB31(color = blue), CERB37(color = blue),
CERC37(color = blue), asta237(color = blue),
asta137(color = blue)}

```

```
rag_cer:= 0.1
```

```
A
```

```
B
```

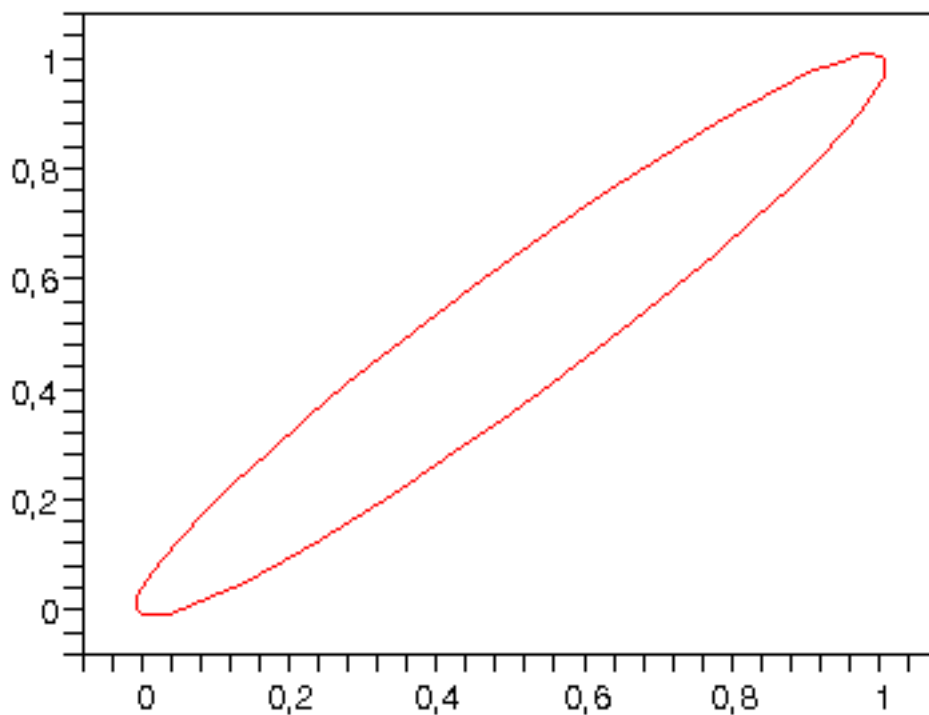
```
assemmin= 0.3
```

```

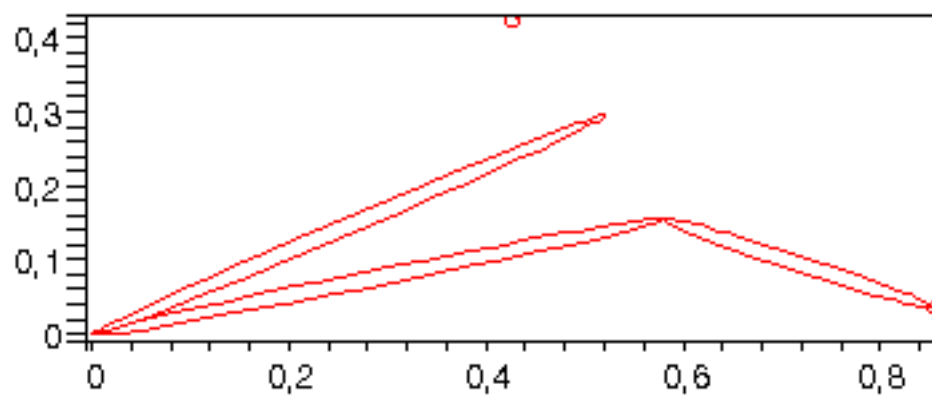
> ellipse(p, ['foci'=[A,B], 'MinorAxis'=0.2], n);
draw(p);
oggetto := {asta1271,asta2371,CERB31,asta1371,CERC371};
draw(oggetto);

```

p



```
oggetto= {asta1371,asta2371,CERC371,CERB31,asta1271,
```



```
> draw(bipendolo);
```

```
Warning, computation interrupted
```

```
>
```