Dany system diferencialnich rovnic v sobe zahrnuje nespocetne mnozstvi ruznych pohybu:

Zde uvadim nektere hodnoty ,ktere kdyz se dosadi na zacatku ,dostane se pozadovany pohyb.

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q=1, m=1,Vx=0 ,Vy=0, Vz=0 ,Bx=0 ,By=0, Bz=0 ,Ex=5 ,Ey=3 ,Ez=1

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Pred kazdou novou volbou je nutne stisknout restart.

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```
> restart:
> with(linalg):

> with(plots):
> with(plottools):
```

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Zadavani

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> Vlastnosti castice:

```
> q:=1:
```
q=Naboj castice

```
> m:=1:
```
m=hmotnost castice

Rychlost:

```
> Vx:=0:
```
Vx = x-ova slozka vektoru rychlosti

```
> Vy:=10:
```
Vy = y -ova slozka vektoru rychlosti

```
> Vz:=10:
```
Vz = z-ova slozka vektoru rychlosti

```
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```
Magneticka indukce

```
> Bx:=0:
  By:=0:
  Bz:=0.3:
```

```
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```
Elektricka intenzita

```
> Ex:=0:
```
Ex = x-ova slozka vektoru elektricke indukce

```
> Ey:=0:
```
Ey = y-ova slozka vektoru elektricke indukce

```
> Ez:=0:
```
Ez = z-ova slozka vektoru elektricke indukce

Vypocty

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>
> M:=array(1..3,1..3,[[i,j,k],[v_x,v_y,v_z],[B_x,B_y,B_z]]);
```

$$M := \begin{bmatrix} i & j & k \\ v\_x & v\_y & v\_z \\ B\_x & B\_y & B\_z \end{bmatrix}$$

```
>
  (det(M));
```

$$i\, v\_y\, B\_z - i\, v\_z\, B\_y - v\_x\, j\, B\_z + v\_x\, k\, B\_y + B\_x\, j\, v\_z - B\_x\, k\, v\_y$$

```
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```

Diferencialni rovnice prepsany do Maple:

```
>
> dif_rov_x := m*D(D(x))(t) = Ex+D(y)(t)*Bz-D(z)(t)*By;
```

$$dif\_rov\_x := (D^{(2)})(x)(t) = 0.3\, D(y)(t)$$

Druha z diferencialnich rovnic pro y-ovou slozku:

```
> dif_rov_y := m*D(D(y))(t) = Ey-D(x)(t)*Bz+D(z)(t)*Bx;
```

$$dif\_rov\_y := (D^{(2)})(y)(t) = -0.3\, D(x)(t)$$

Treti z diferencialnich rovnic pro z-ovou slozku:

```
> dif_rov_z := m*D(D(z))(t) = Ez+D(x)(t)*By-D(y)(t)*Bx;
```

$$dif\_rov\_z := (D^{(2)})(z)(t) = 0$$

```
>
```

Laplaceova transformace diferencialni rovnice pro x-slozku .

```
> lap_x := inttrans[laplace](dif_rov_x,t,s);
```

$$lap\_x := s^{2.}\, \mathrm{laplace}(x(t), t, s) - 1.\, D(x)(0.) - 1.\, s\, x(0.) = 0.3000000000\, s\, \mathrm{laplace}(y(t), t, s) - 0.3000000000\, y(0.)$$

```
>
```

Laplaceova transformace diferencialni rovnice pro y-slozku .

```
> lap_y := inttrans[laplace](dif_rov_y,t,s);
```

$$lap\_y := s^{2.}\, \mathrm{laplace}(y(t), t, s) - 1.\, D(y)(0.) - 1.\, s\, y(0.) = -0.3000000000\, s\, \mathrm{laplace}(x(t), t, s) + 0.3000000000\, x(0.)$$

```
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```

Laplaceova transformace diferencialni rovnice pro z-slozku .

```
> lap_z := inttrans[laplace](dif_rov_z,t,s);
```

$$lap\_z := s^{2}\, \mathrm{laplace}(z(t), t, s) - D(z)(0) - s\, z(0) = 0$$

```
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```

Reseni soustavy linearnich rovnic pro Laplaceovy obrazy:

```
> Obraz:=solve({lap_x,lap_y,lap_z},{laplace(x(t),t,s),laplace(y(t)
  ,t,s),laplace(z(t),t,s)}):
> assign(Obraz);
>
> reseni_x:=laplace(x(t),t,s);
```

$$reseni\_x := \frac{100.\, s\, D(x)(0) + 100.\, s^{2}\, x(0) + 9.\, x(0) + 30.\, D(y)(0)}{s\,(9. + 100.\, s^{2})}$$

```
>
>
> reseni_y := laplace(y(t),t,s);
```

$$reseni\_y := -\frac{1.\,(-100.\, s\, D(y)(0) - 9.\, y(0) - 100.\, y(0)\, s^{2} + 30.\, D(x)(0))}{s\,(9. + 100.\, s^{2})}$$

```
>
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```

```
reseni_z := laplace(z(t),t,s);
```

$$reseni\_z := \frac{D(z)(0) + s\, z(0)}{s^2}$$

```
>
>
```

<u>Pocatecni podminky</u> odpovidaji tomu ze x-ova , y-ova a z-ova slozka polohoveho vektoru v case nula jsou nulove a x-ova y-ova a z-ova slozka rychlosti v case nula je po rade Vx ,Vy , Vz (jak bylo zvoleno na zacatku pri zadavani)

```
> Pocatecni_podminky
  :=({D(x)(0)=Vx,D(y)(0)=Vy,D(z)(0)=Vz,x(0)=0,y(0)=0,z(0)=0});
```

$$Pocatecni\_podminky := \{ x(0) = 0, y(0) = 0, z(0) = 0, D(x)(0) = 0, D(y)(0) = 10, D(z)(0) = 10 \}$$

```
> reseni_x :=subs(Pocatecni_podminky,reseni_x);
```

$$reseni\_x := \frac{300.}{s\,(9. + 100.\, s^2)}$$

```
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```

```
> reseni_y :=subs(Pocatecni_podminky,reseni_y);
```

$$reseni\_y := \frac{1000.}{9. + 100.\, s^2}$$

```
>
```

```
> reseni_z :=subs(Pocatecni_podminky,reseni_z);
```

$$reseni\_z := \frac{10}{s^2}$$

```
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```

<u>Nyni budu aplikovat inverzni Laplaceovu transformace</u>:

```
>
>
```

Hledana skalarni funkce x(t) x-ove slozky polohoveho vektoru ziskana pomoci inverzni Laplaceovy transformaci.

```
> slozka_x:=inttrans[invlaplace](reseni_x,s,t);
```

$$slozka\_x := 33.33333333 - 33.33333333 \cos(0.3000000000\, t)$$

```
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```

Hledana skalarni funkce y(t) y-ove slozky polohoveho vektoru ziskana pomoci inverzni Laplaceovy transformace.

```
> slozka_y:=inttrans[invlaplace](reseni_y,s,t);
```

$$slozka\_y := 33.33333333 \sin(0.3000000000\, t)$$

```
>
```

Hledana skalarni funkce z(t) z-ove slozky polohoveho vektoru ziskana pomoci inverzni Laplaceovy transformace.

```
> slozka_z:=inttrans[invlaplace](reseni_z,s,t);
```

$$slozka\_z := 10\, t$$

```
> x:=unapply(slozka_x,t):
> y:=unapply(slozka_y,t):
  z:=unapply(slozka_z,t):

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>
> theta:=27:
  phi:=15:

>
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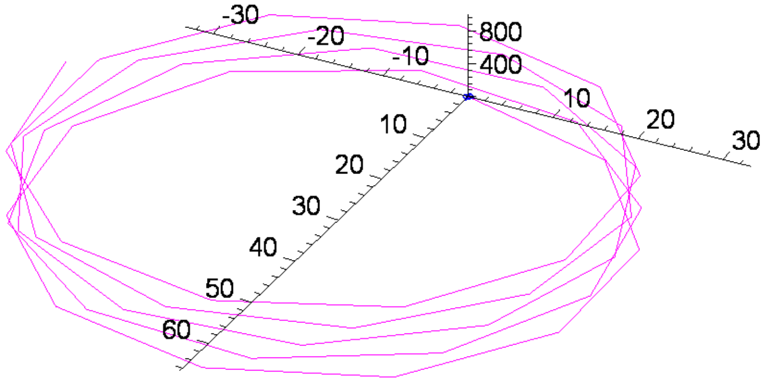
>
> plot1:=spacecurve([x(4*a),y(4*a),z(4*a)],a=0..25,axes=normal,sca
  ling=constrained,orientation=[theta,phi],color=magenta):
> bod := seq(point([x(4*a),y(4*a),z(4*a)], color=blue,
  thickness=9),a=0..25):
  plot2:=plots[display](bod
  ,symbol=diamond,thickness=9,insequence=true):
> display(plot1,plot2,scaling=unconstrained);
```



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