

# Laborator 1

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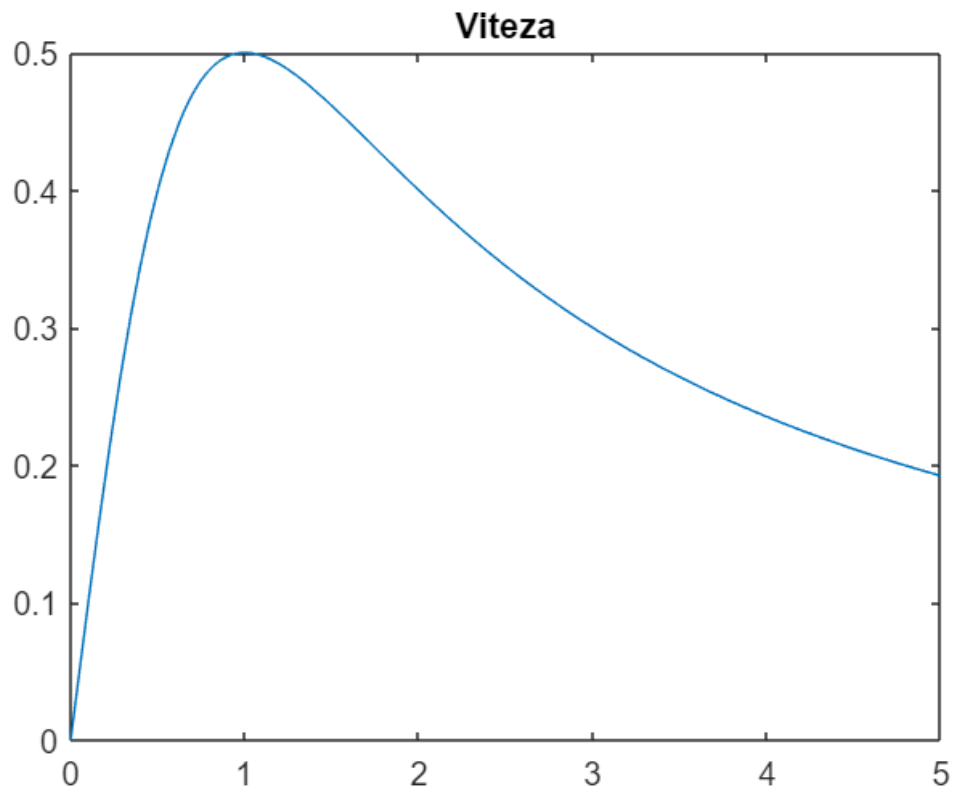
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## Problema 1

```
t_0=0;
t_f=5;

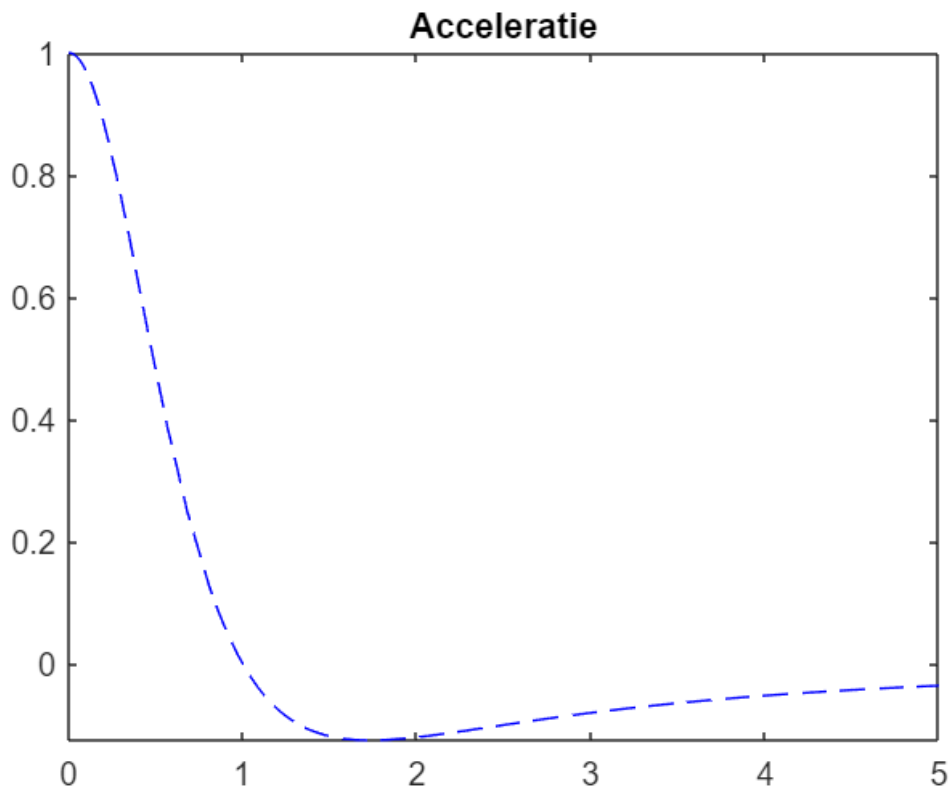
syms t

v(t)= t ./ (t.^2 +1);
figure(1)
fplot(v,[t_0,t_f])
title('Viteza')
```



```
a=diff(v,t);
```

```
figure(2)
fplot(a,[t_0,t_f],'b --');
title('Acceleratie')
```



## Problema 2

a)

```
syms t;
b=2; c=3;

x=2*b*(sin(t)).^2;
y=c*sin(t).*cos(t);

vx=diff(x,t)
```

$$vx = 8 \cos(t) \sin(t)$$

```
vy=diff(y,t)
```

$$vy = 3 \cos(t)^2 - 3 \sin(t)^2$$

```
v=sqrt(vx.^2+vy.^2);
```

```
ax=diff(vx,t)
```

$$a_x = 8 \cos(t)^2 - 8 \sin(t)^2$$

```
ay=diff(vy,t)
```

$$a_y = -12 \cos(t) \sin(t)$$

```
a=sqrt(ax.^2+ay.^2);
```

```
a_t=diff(v,t);  
a_n=sqrt(a.^2-a_t.^2);  
R=(v.^2)/a_n;  
R=simplify(R)
```

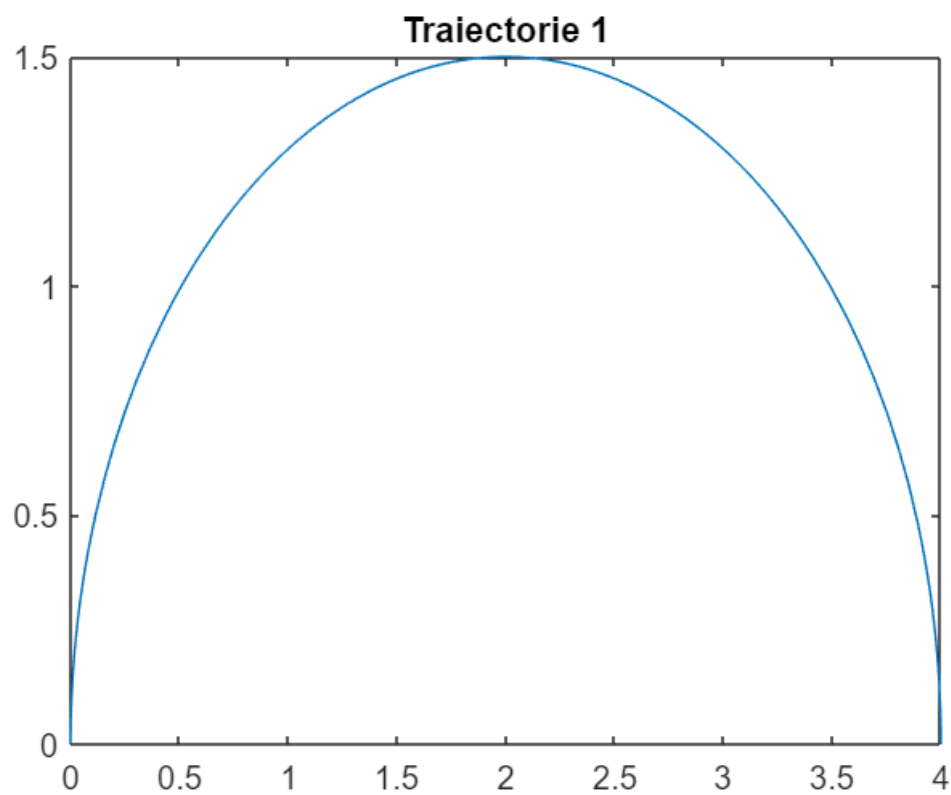
R =

$$-\frac{\sqrt{2} (7 \cos(4t) - 25)}{96 \sqrt{-\frac{1}{7 \cos(4t) - 25}}}$$

**b)**

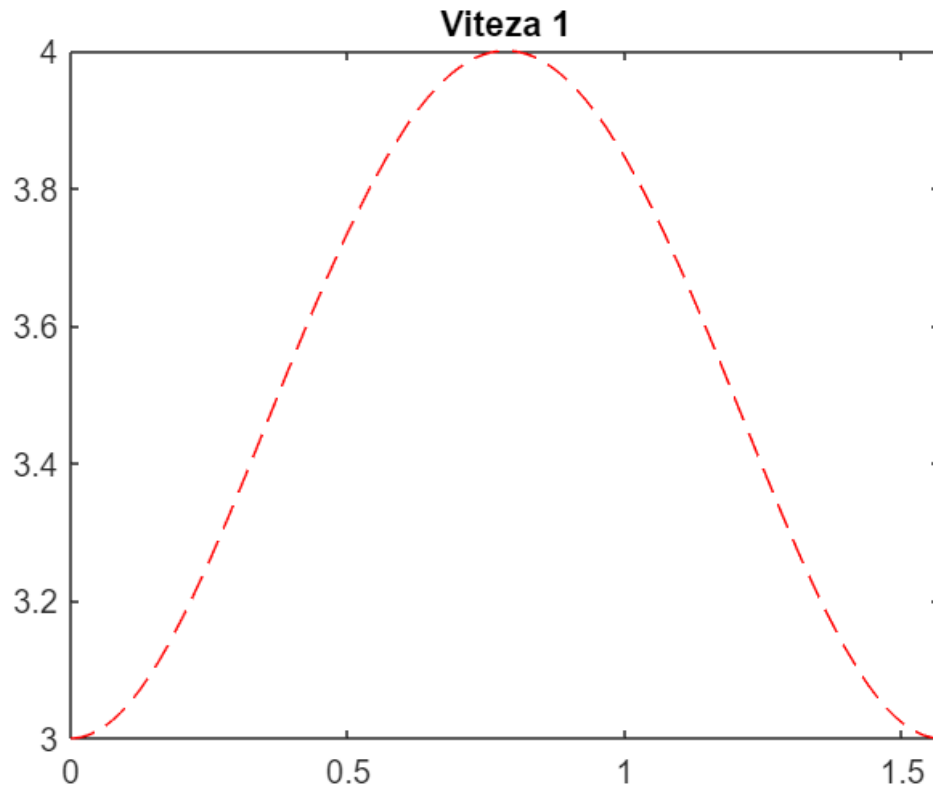
```
t_0=0; t_f=pi/2;
```

```
figure(1)  
fplot(x,y,[t_0,t_f])  
title('Trajectorie 1')
```

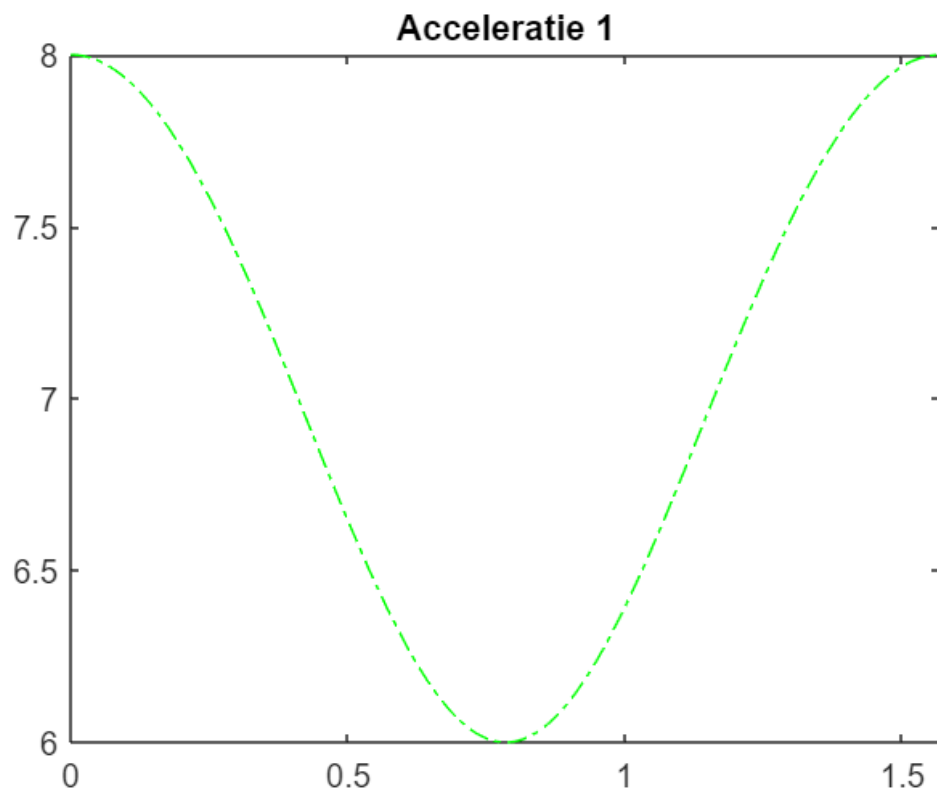


```
figure(2)
```

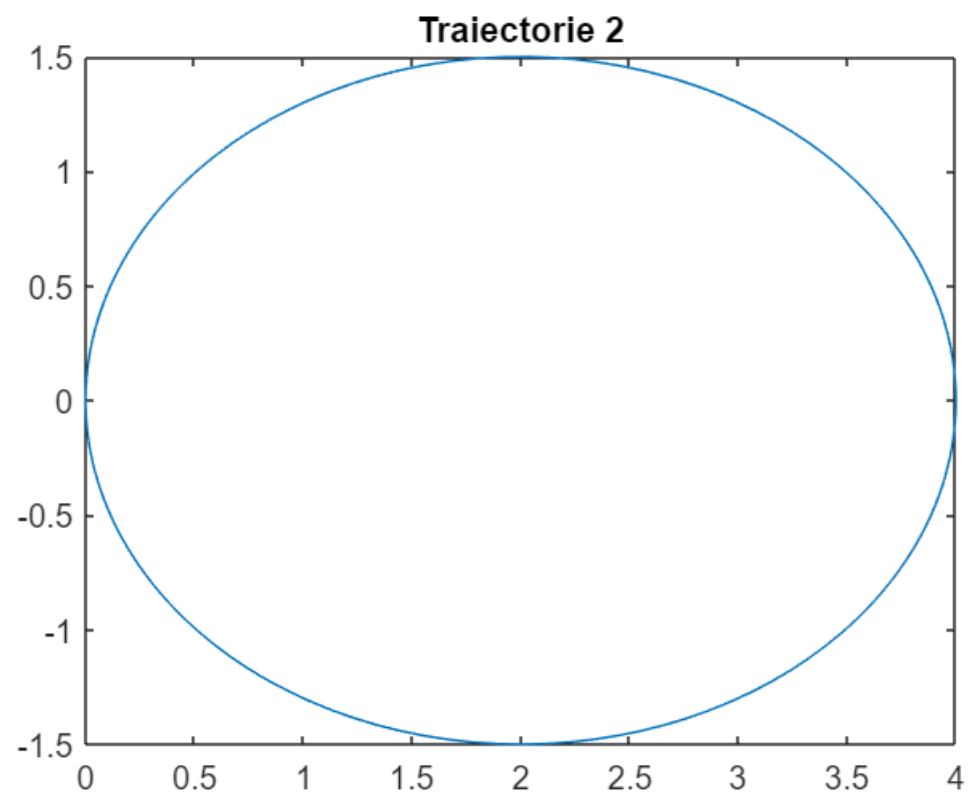
```
fplot(v,[t_0,t_f],'r--')  
title('Viteza 1')
```



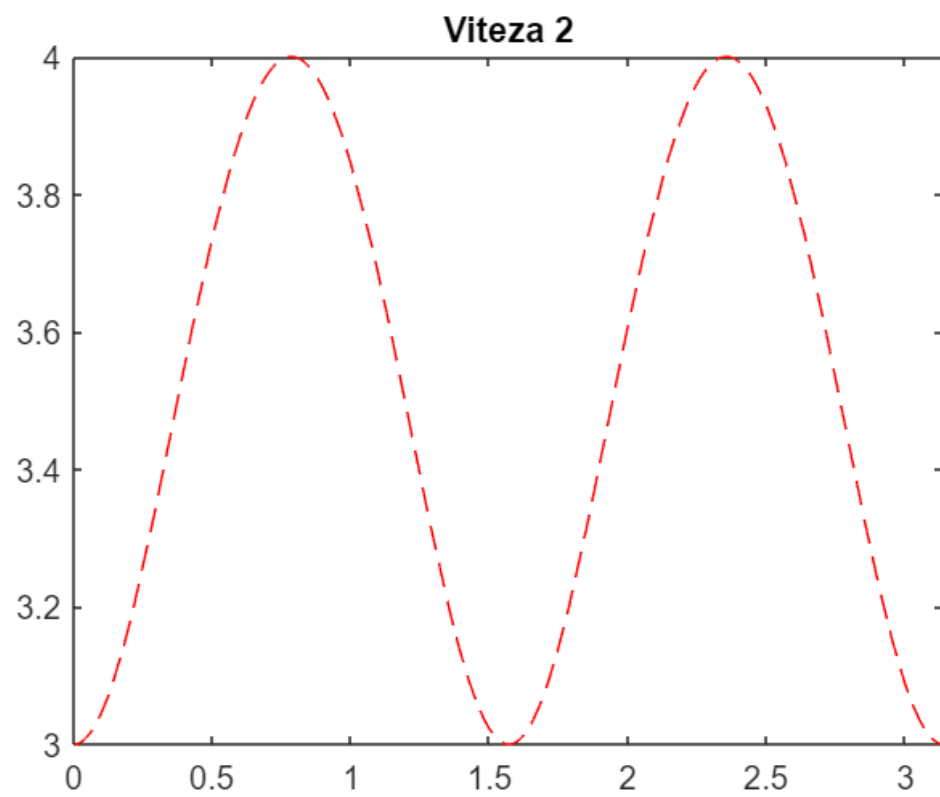
```
figure(3)  
fplot(a,[t_0,t_f],'g-.')  
title('Acceleratie 1')
```



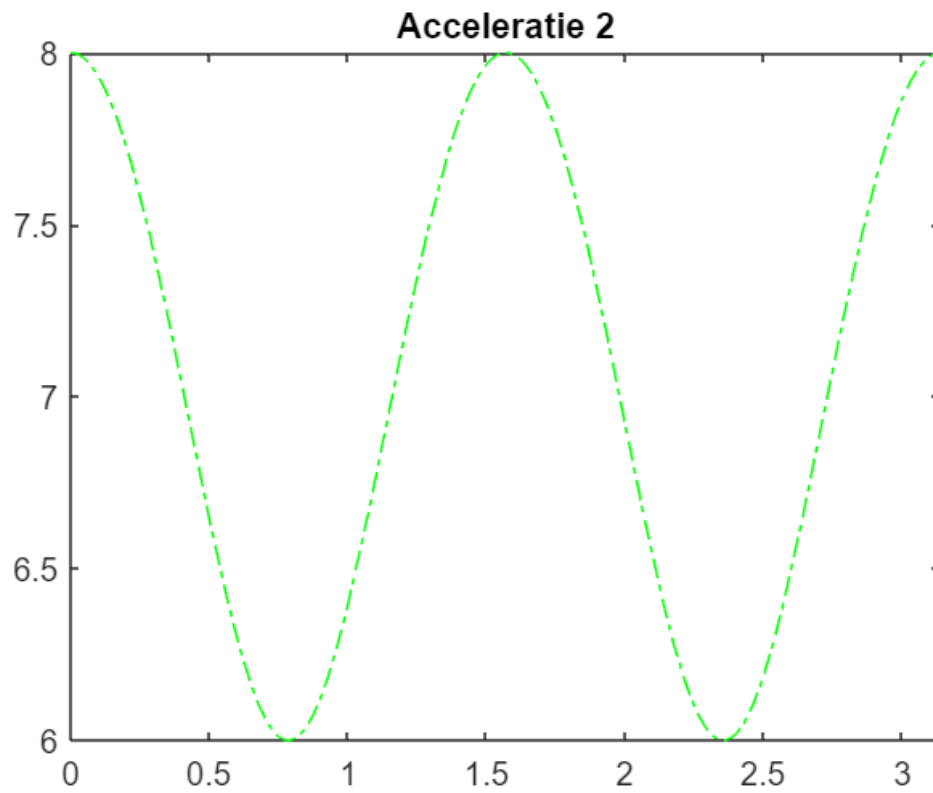
```
b=1; c=4;  
t_0=0; t_f=pi;  
  
figure(4)  
fplot(x,y,[t_0,t_f])  
title('Traiettorie 2')
```



```
figure(5)
fplot(v,[t_0,t_f],'r--')
title('Viteza 2')
```



```
figure(6)
fplot(a,[t_0,t_f],'g-.')
title('Acceleratie 2')
```



### Problema 3

a)

```
syms t;
```

```
x=t.*cos(t);
y=t.*sin(t);
z=log(t+1);
```

```
vx=diff(x,t)
```

```
vx = cos(t) - t sin(t)
```

```
vy=diff(y,t)
```

```
vy = sin(t) + t cos(t)
```

```
vz=diff(z,t)
```

```
vz =
```

$$\frac{1}{t+1}$$

```
v=sqrt(vx.^2+vy.^2+vz.^2);
```



```
ax=diff(vx,t)
```

$$a_x = -2 \sin(t) - t \cos(t)$$

```
ay=diff(vy,t)
```

$$a_y = 2 \cos(t) - t \sin(t)$$

```
az=diff(vz,t)
```

az =

$$-\frac{1}{(t+1)^2}$$

```
a=sqrt(ax.^2+ay.^2+az.^2);
```

```
a_t=diff(v,t);
```

```
a_n=sqrt(a.^2-a_t.^2);
```

```
R=(v.^2)/a_n;
```

```
R=simplify(R)
```

R =

$$\frac{\sigma_1}{\sqrt{\frac{1}{(t+1)^4} + (2 \sin(t) + t \cos(t))^2 + (2 \cos(t) - t \sin(t))^2 - \frac{(t^4 + 3t^3 + 3t^2 + t - 1)^2}{(t+1)^6 \sigma_1}}}$$

where

$$\sigma_1 = \frac{1}{(t+1)^2} + (\sin(t) + t \cos(t))^2 + (\cos(t) - t \sin(t))^2$$

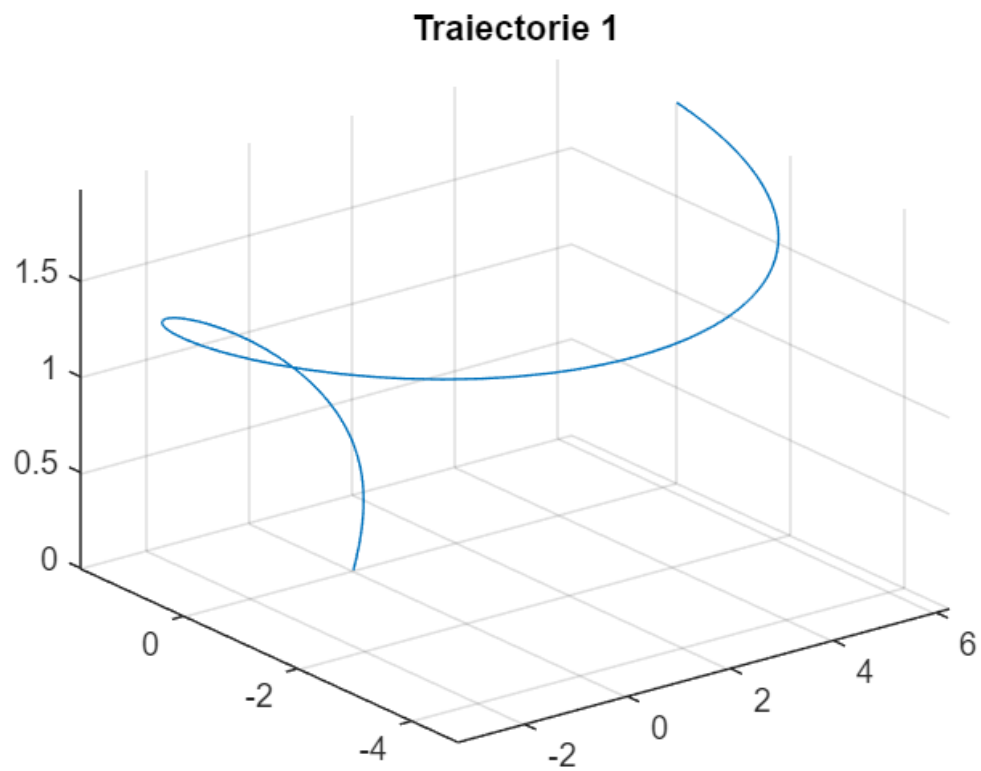
**b)**

```
t_0=0; t_f=2*pi;
```

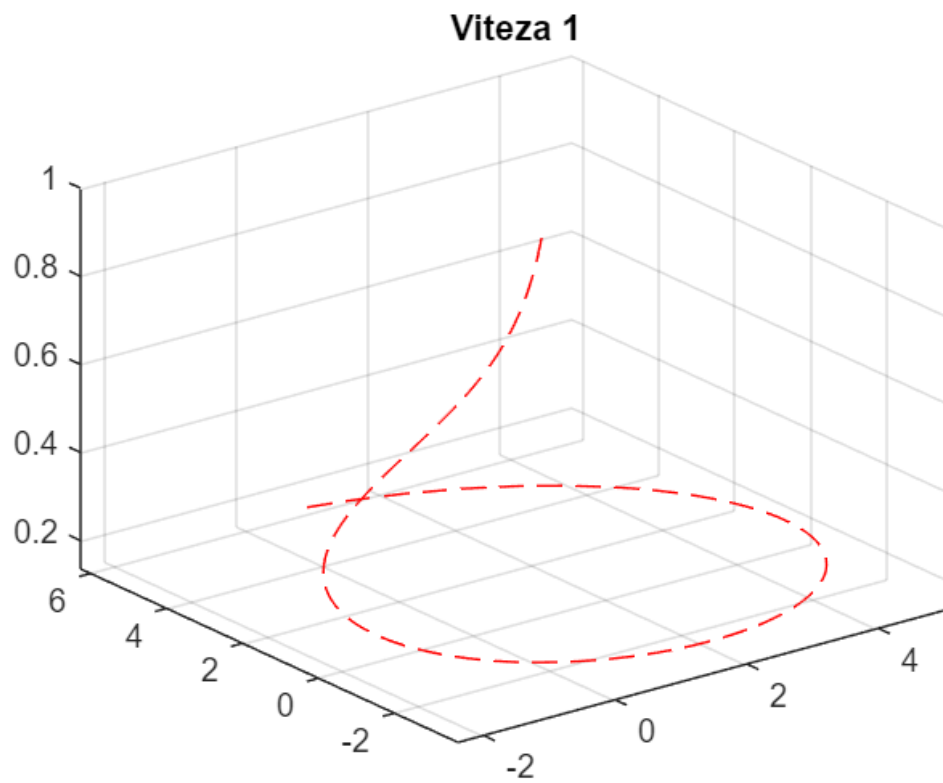
```
figure(1)
```

```
fplot3(x,y,z,[t_0,t_f])
```

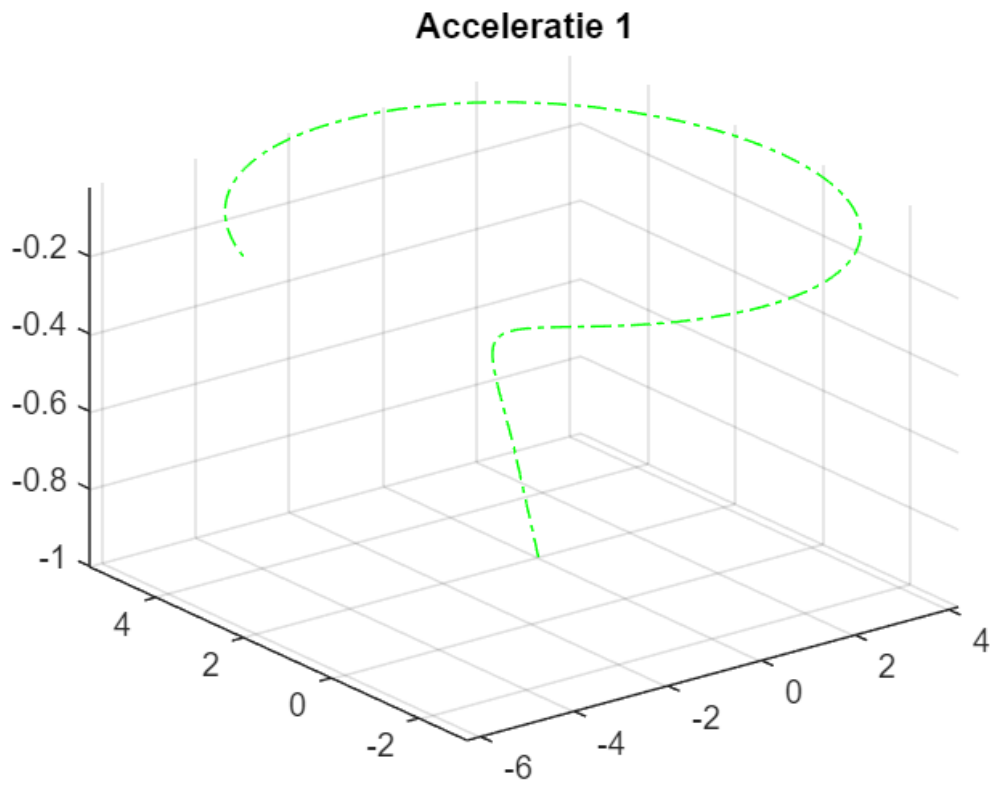
```
title('Traiettorie 1')
```



```
figure(2)
fplot3(vx,vy,vz,[t_0,t_f],'r--')
title('Viteza 1')
```

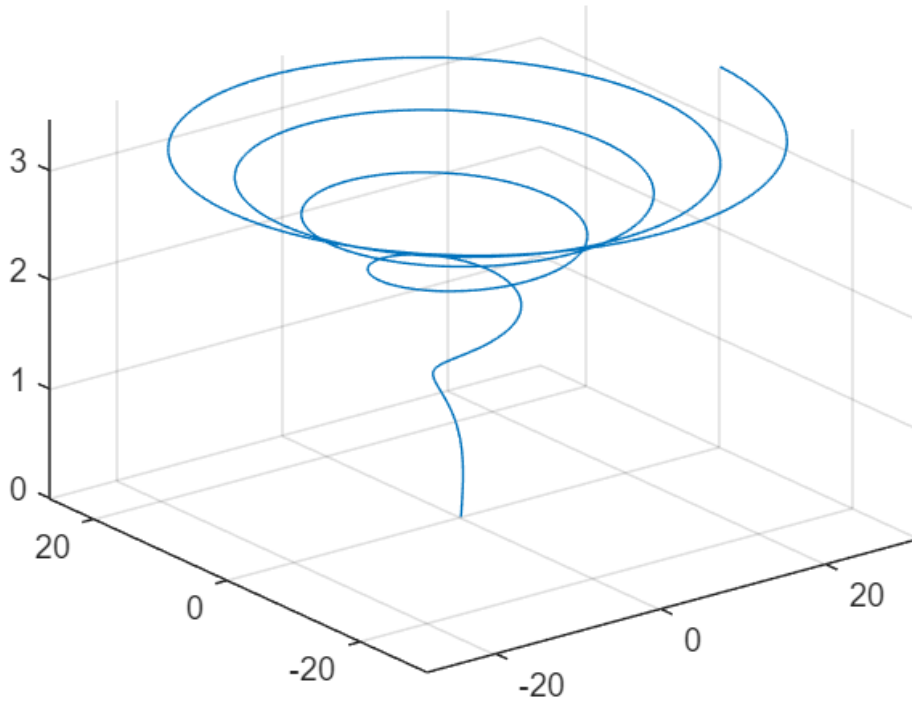


```
figure(3)
fplot3(ax,ay,az,[t_0,t_f],'g-.-')
title('Acceleratie 1')
```

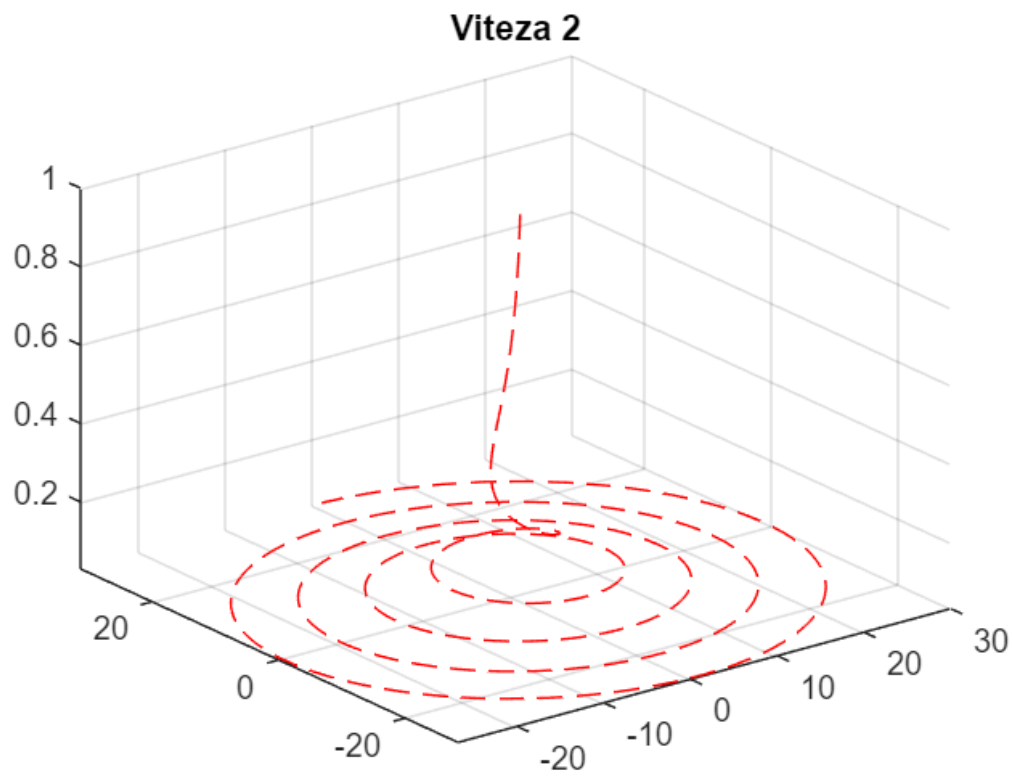


```
t_0=0; t_f=10*pi;  
figure(1)  
fplot3(x,y,z,[t_0,t_f])  
title('Traietorie 2')
```

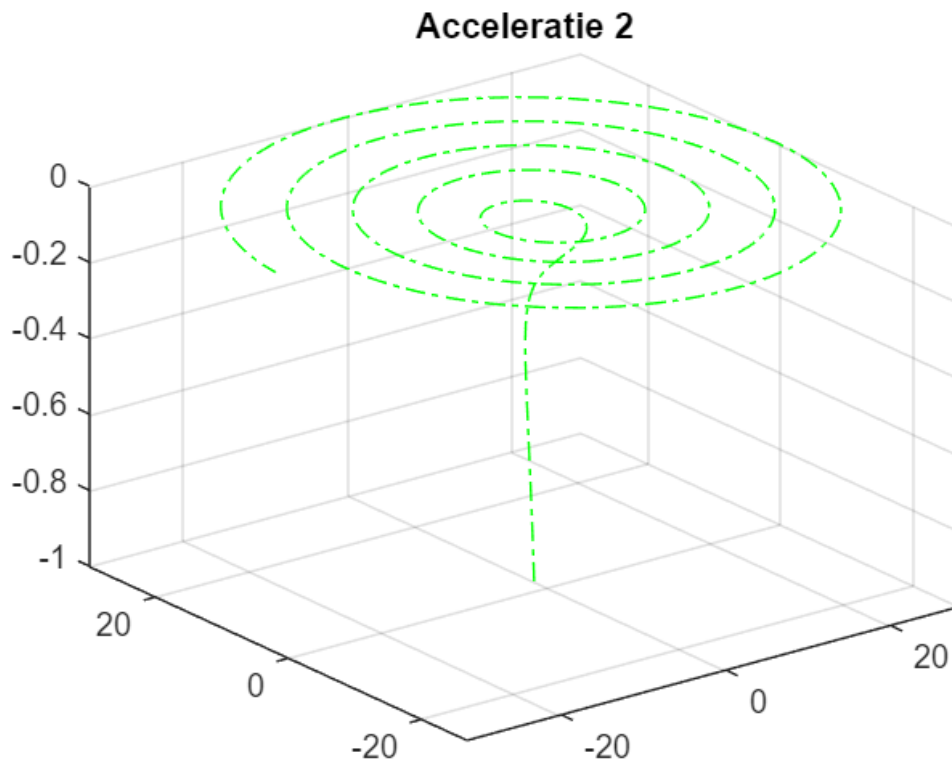
**Traiettorie 2**



```
figure(2)
fplot3(vx,vy,vz,[t_0,t_f],'r--')
title('Viteza 2')
```



```
figure(3)
fplot3(ax,ay,az,[t_0,t_f],'g-.-')
title('Acceleratie 2')
```



## Problema 4

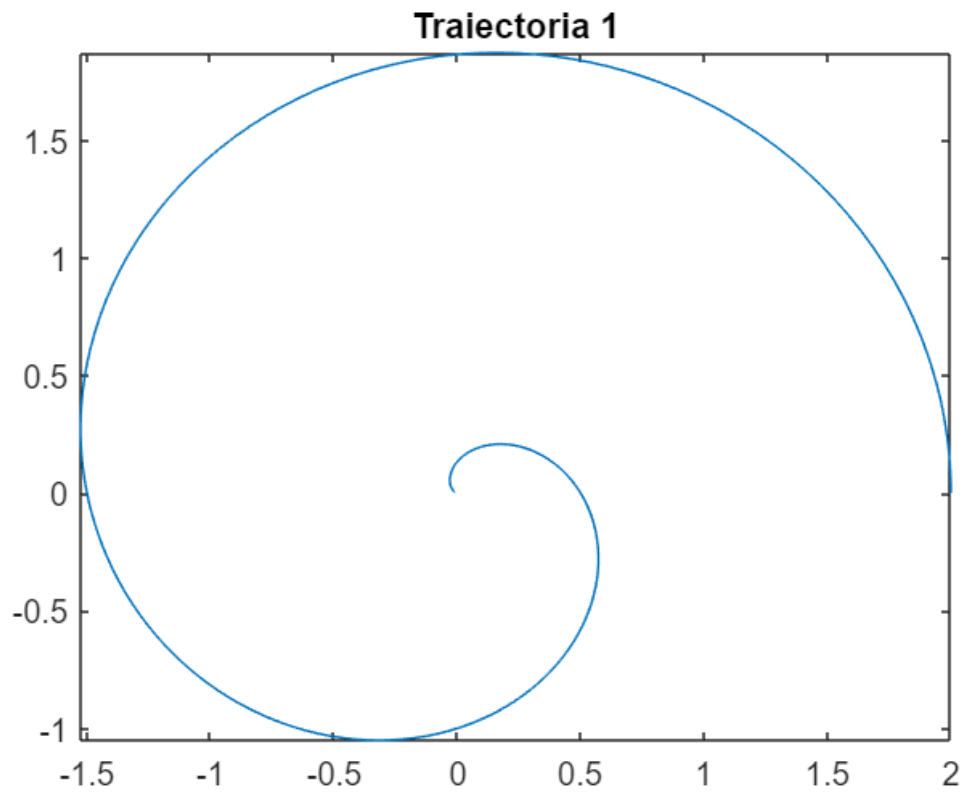
```
syms t
b=1; k=3;

rho=b+b*cos(t);
theta=k*t;

x=rho.*cos(theta);
y=rho.*sin(theta);

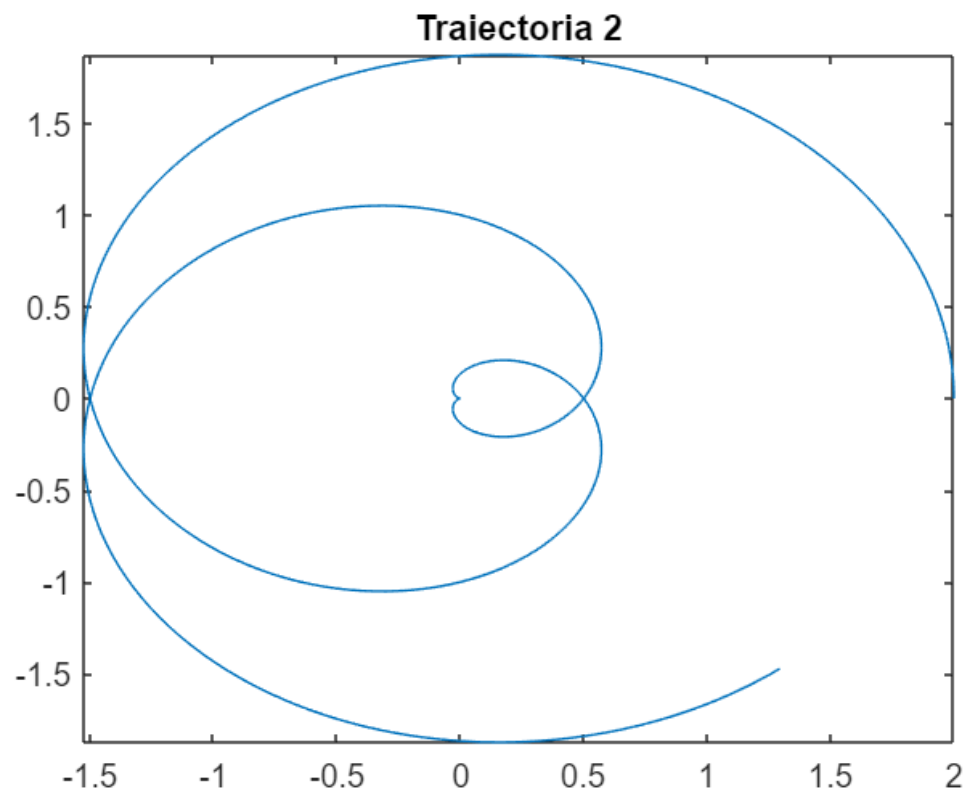
t_0=0; t_f=3;

figure(1)
fplot(x,y,[t_0,t_f])
title("Traiectoria 1")
```



```
b=5; k=2;  
t_0=0; t_f=6;  
  
figure(2)  
fplot(x,y,[t_0,t_f])  
title("Traietoria 2")
```





```
b=0.5; k=4;  
t_0=0; t_f=9;  
  
figure(3)  
fplot(x,y,[t_0,t_f])  
title("Traietoria 3")
```

