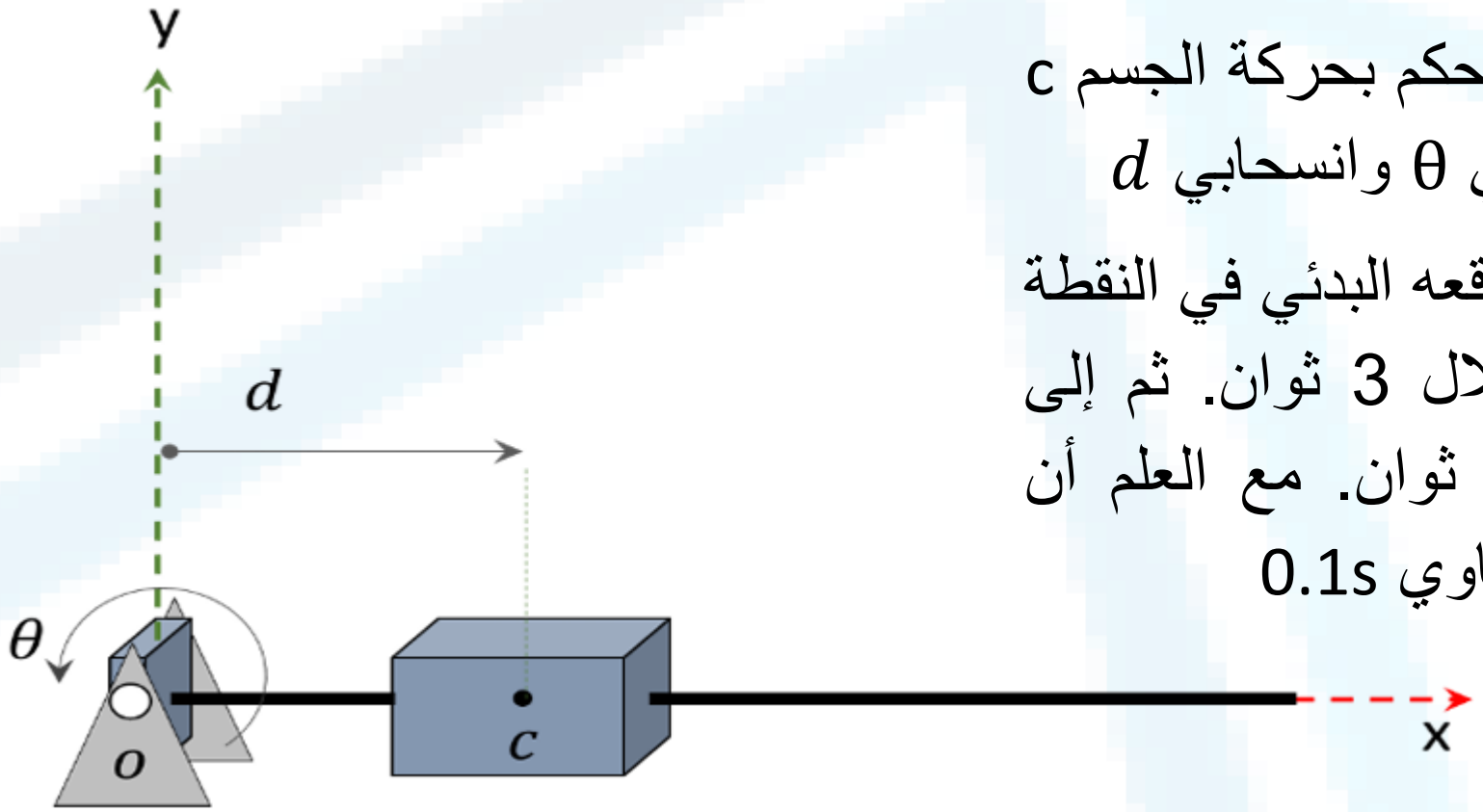
Robot Control

Multi-Axis Motion

Exercise

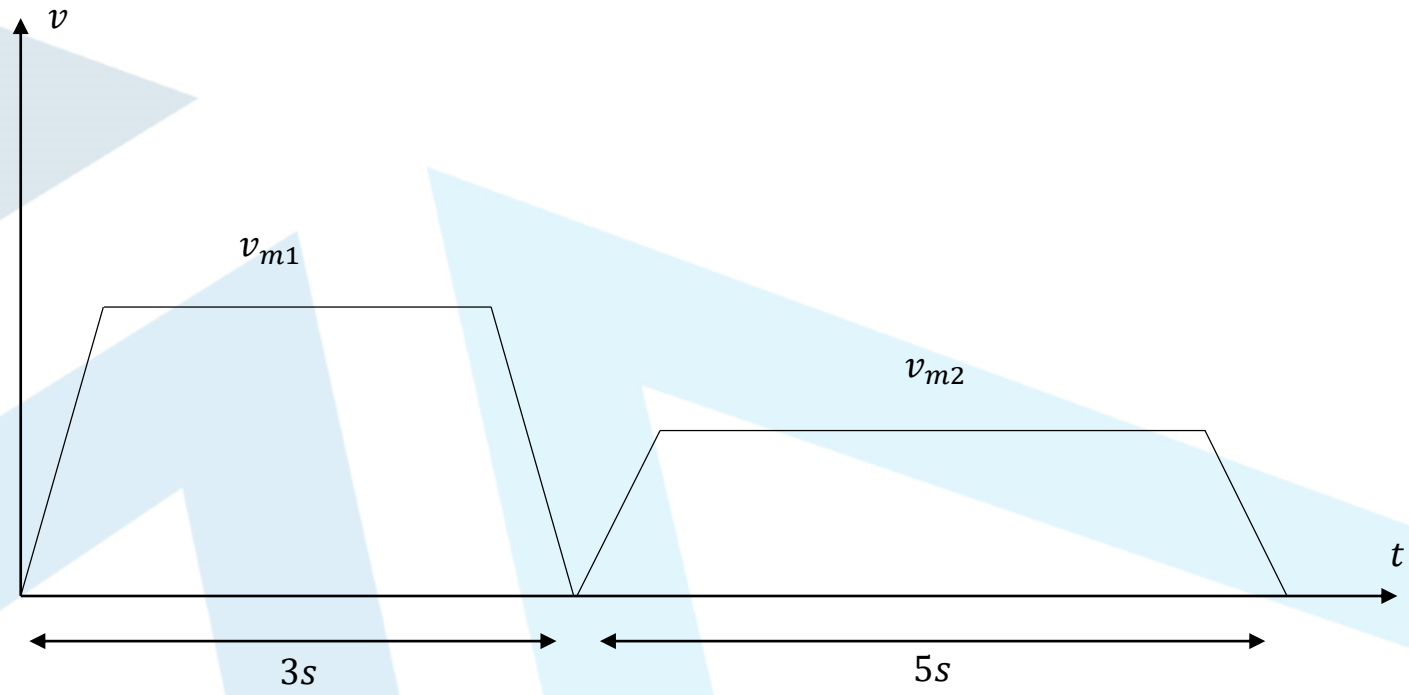


في المنظومة التالية، يتم التحكم بحركة الجسم c عن طريق محركين دوراني θ وانسحابي d

يطلب نقل الجسم c من موقعه البدئي في النقطة O إلى النقطة A(3,4) خلال 3 ثوان. ثم إلى النقطة B(5,12) خلال 5 ثوان. مع العلم أن أزمنة التسارع والتباطؤ تساوي 0.1s

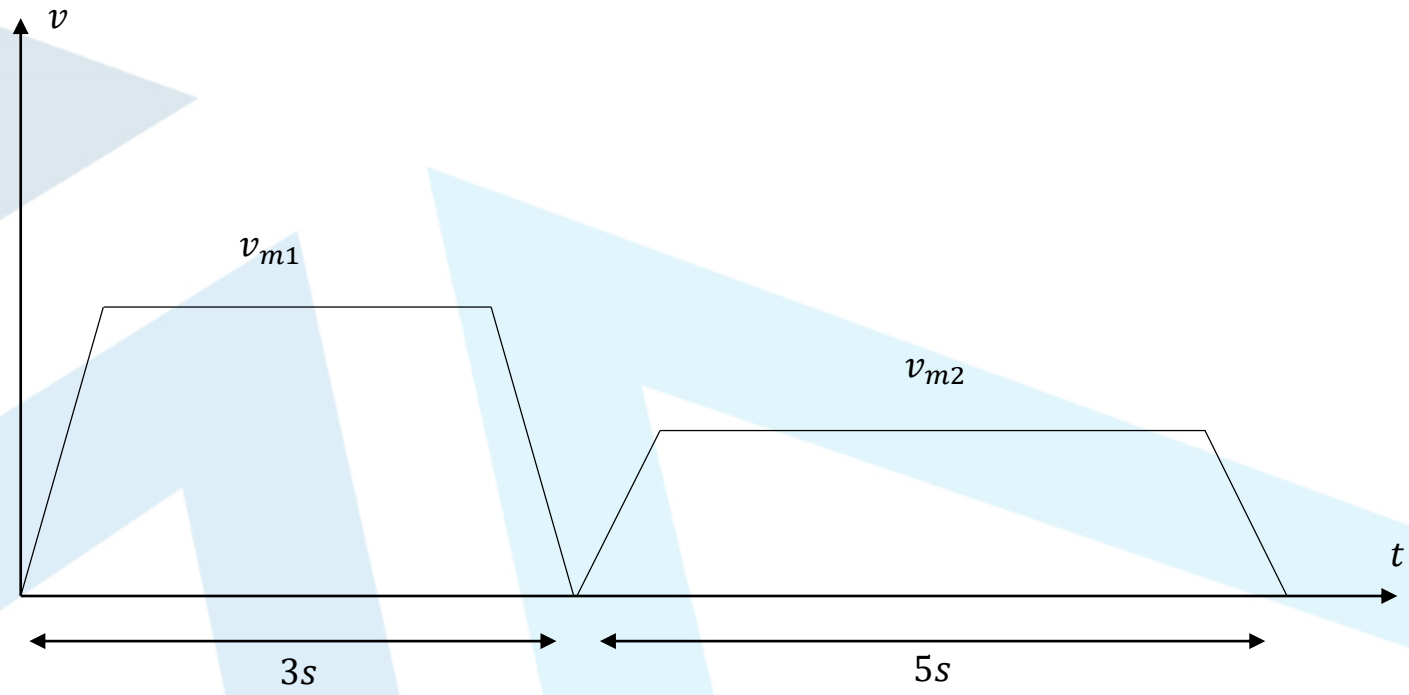
Solution

- $d_1 = ?$
- $d_2 = ?$
- $v_{m1} = ?$
- $v_{m2} = ?$



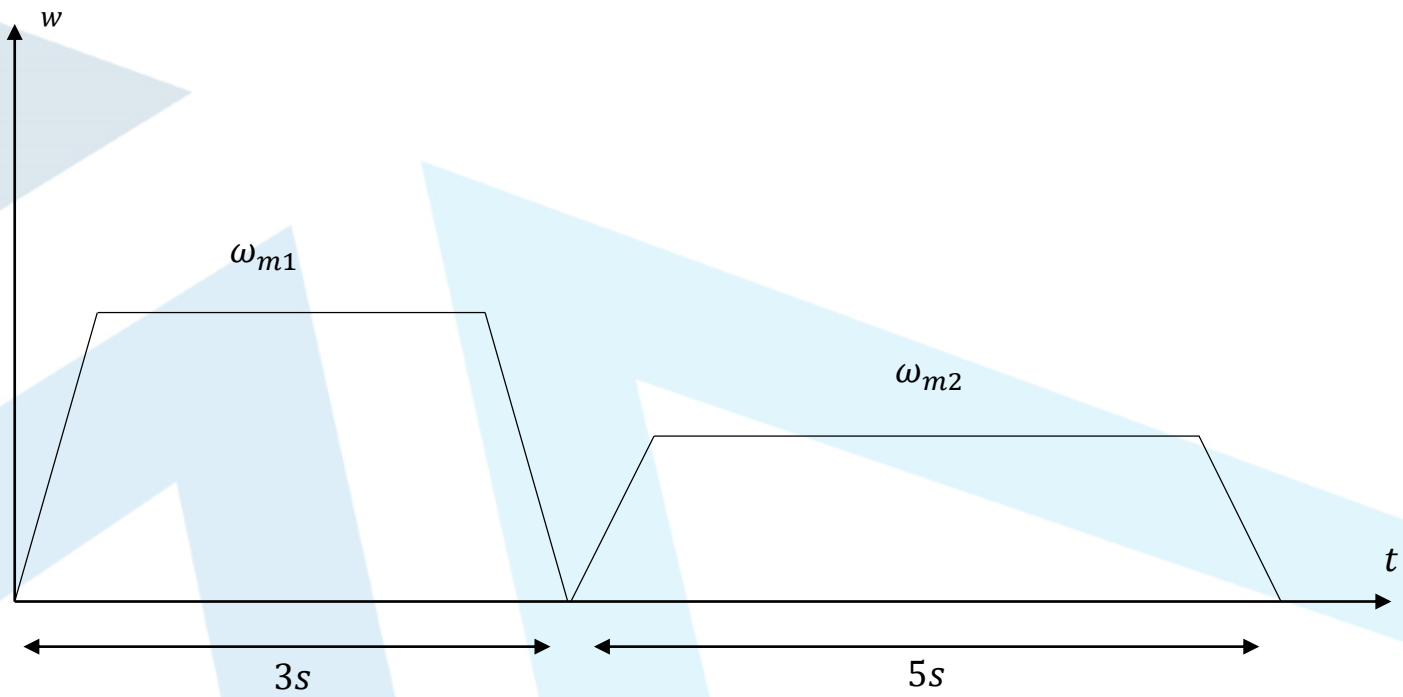
Solution

- $d_1 = 5$
- $d_2 = 8$
- $v_{m1} = 1.724$
- $v_{m2} = 1.633$



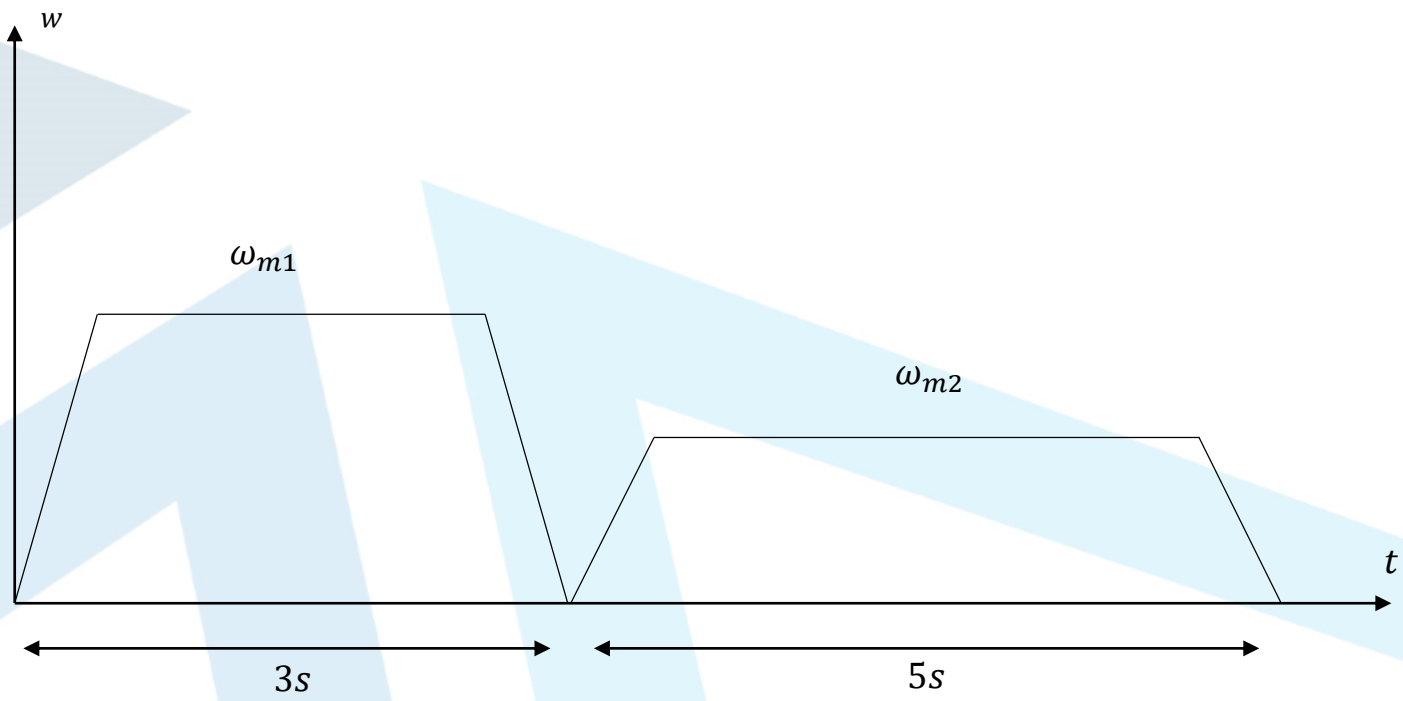
Solution

- $\theta_1 = ?$
- $\theta_2 = ?$
- $\omega_{m1} = ?$
- $\omega_{m2} = ?$



Solution

- $\theta_1 = 0.927$
- $\theta_2 = 0.249$
- $\omega_{m1} = 0.32$
- $\omega_{m2} = 0.051$

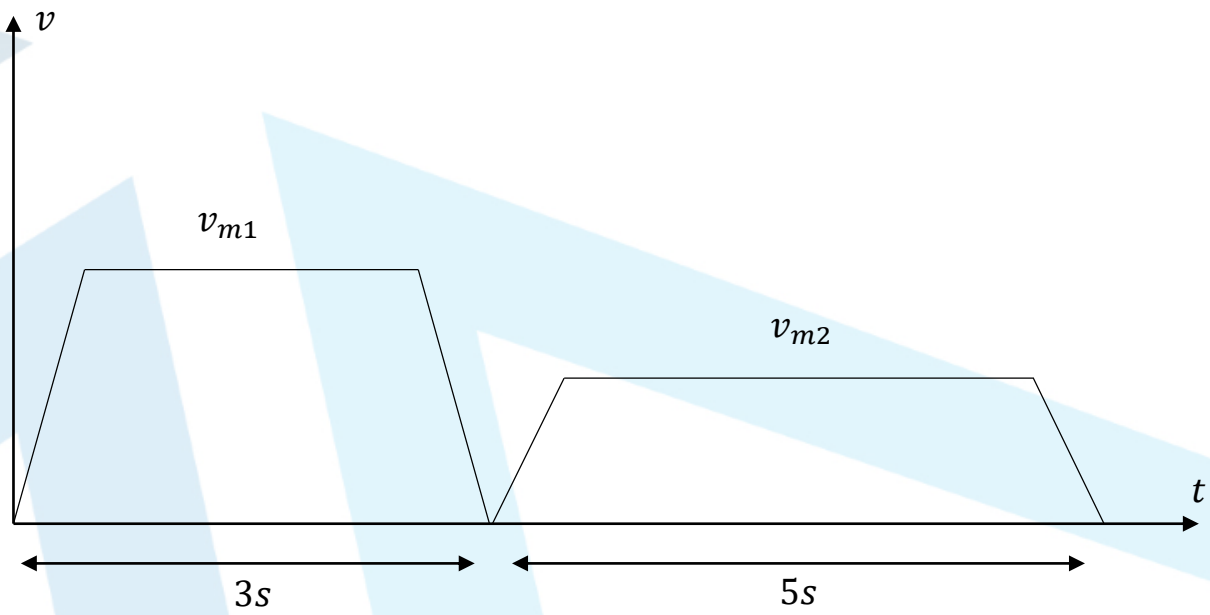


MATLAB Code

```
Ttotal = 8;
dt = 0.001;

vm1 = 1.724;
vm2 = 1.633;

wm1 = 0.32;
wm2 = 0.051;

T = 0:dt:Ttotal;
Aw = zeros(size(T));
Av = zeros(size(T));
```

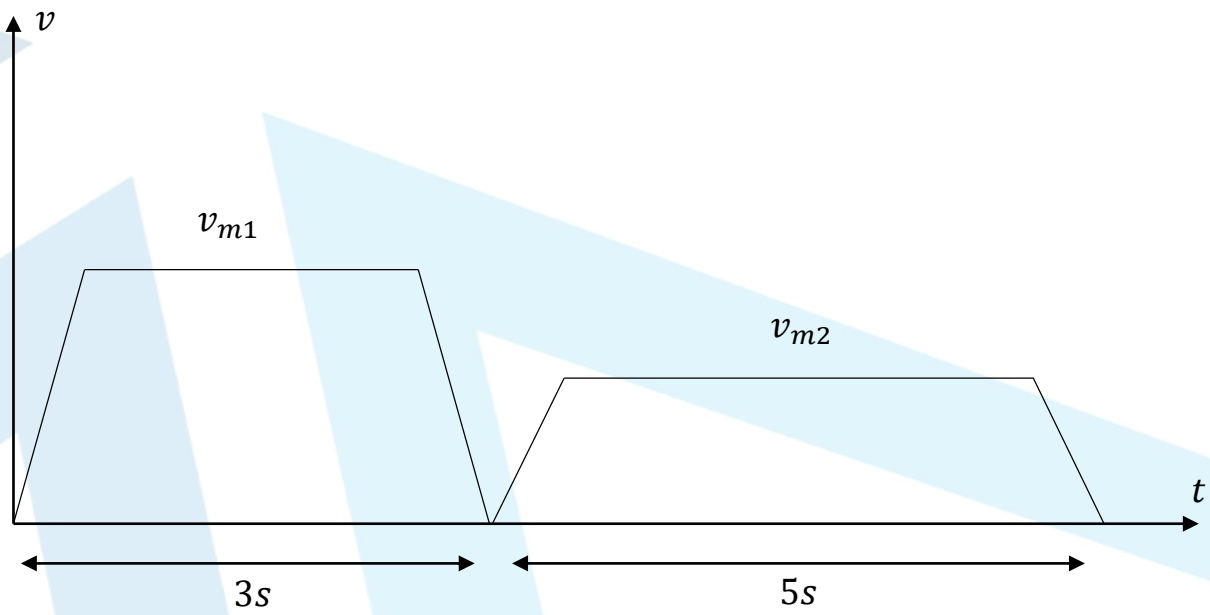
MATLAB Code

```
Av(T > 0    & T <= 0.1) = vm1/0.1;
Av(?) = ?;
Av(?) = ?;

Av(?) = ?;
Av(?) = ?;
Av(?) = ?;
```



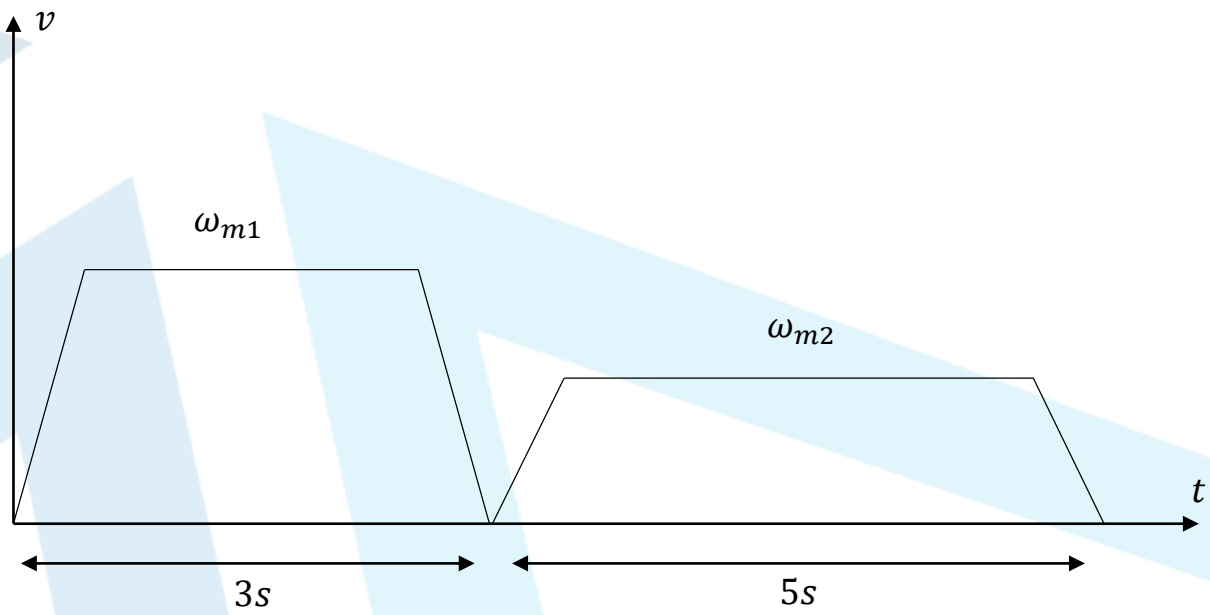
MATLAB Code

```
Av(T > 0    & T <= 0.1) = vm1/0.1;
Av(T > 0.1    & T <= 2.9) = 0;
Av(T > 2.9    & T <= 3) = -vm1/0.1;

Av(T > 3    & T <= 3.1) = vm2/0.1;
Av(T > 3.1    & T <= 7.9) = 0;
Av(T > 7.9    & T <= 8) = -vm2/0.1;
```



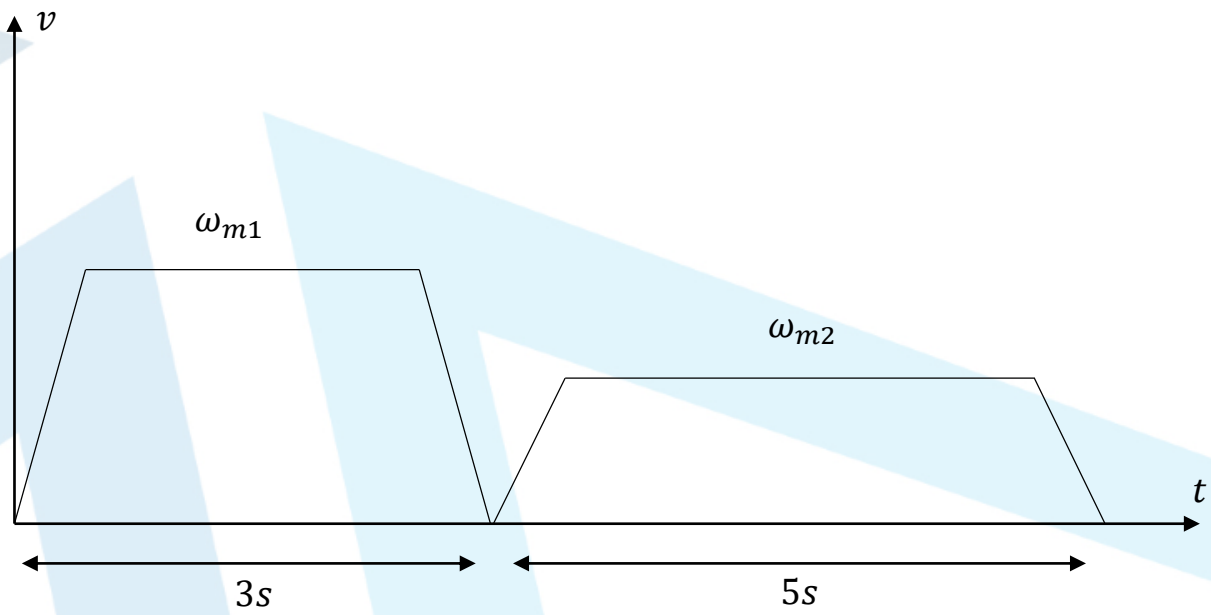
MATLAB Code

```
Aw(T > 0    & T <= 0.1) = wm1/0.1;
Aw(?) = ?;
Aw(?) = ?;

Aw(?) = ?;
Aw(?) = ?;
Aw(?) = ?;
```



MATLAB Code

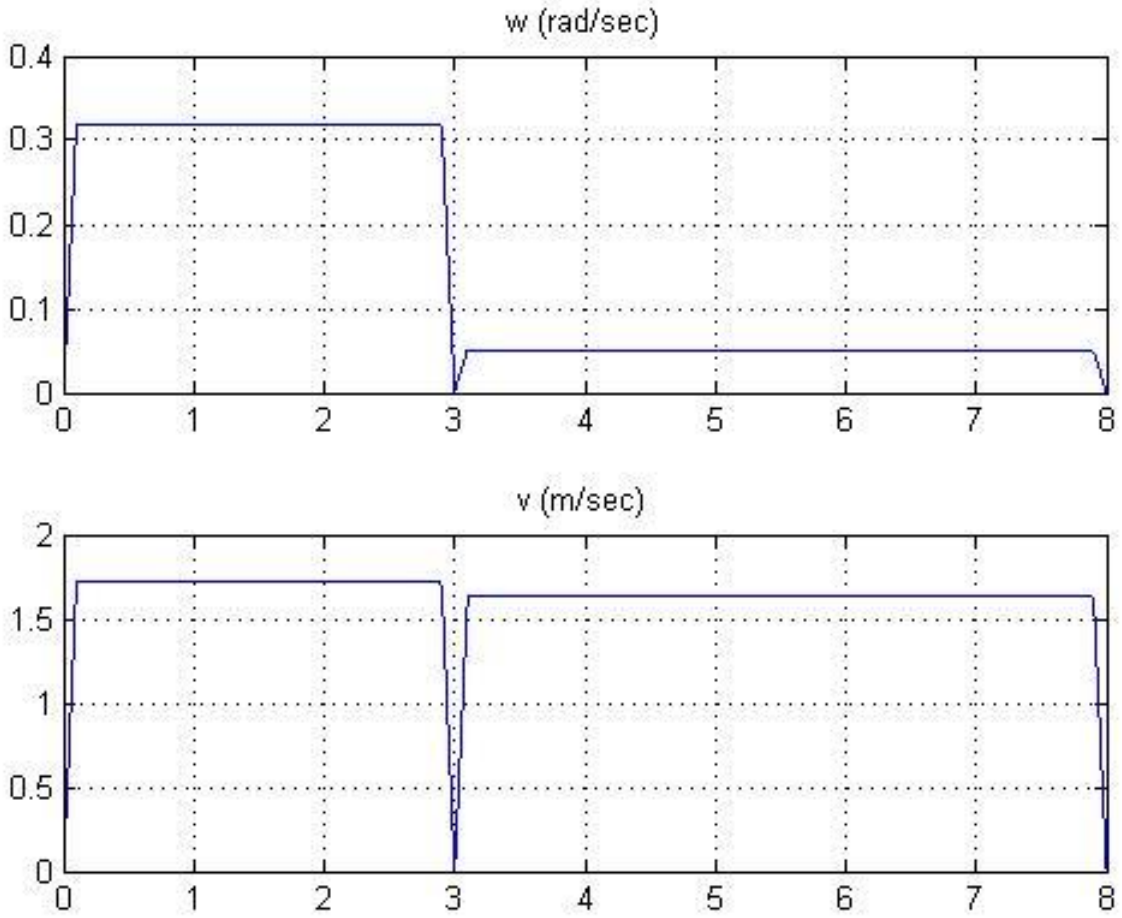
```
Aw(T > 0    & T <= 0.1) = wm1/0.1;
Aw(T > 0.1    & T <= 2.9) = 0;
Aw(T > 2.9    & T <= 3) = -wm1/0.1;

Aw(T > 3    & T <= 3.1) = wm2/0.1;
Aw(T > 3.1    & T <= 7.9) = 0;
Aw(T > 7.9    & T <= 8) = -wm2/0.1;
```



MATLAB Code

```
W = cumtrapz(T,Aw);
V = cumtrapz(T,Av);

subplot(2,1,1)
plot(T,W)
title('w (rad/sec)'), grid

subplot(2,1,2)
plot(T,V)
title('v (m/sec)'), grid
```

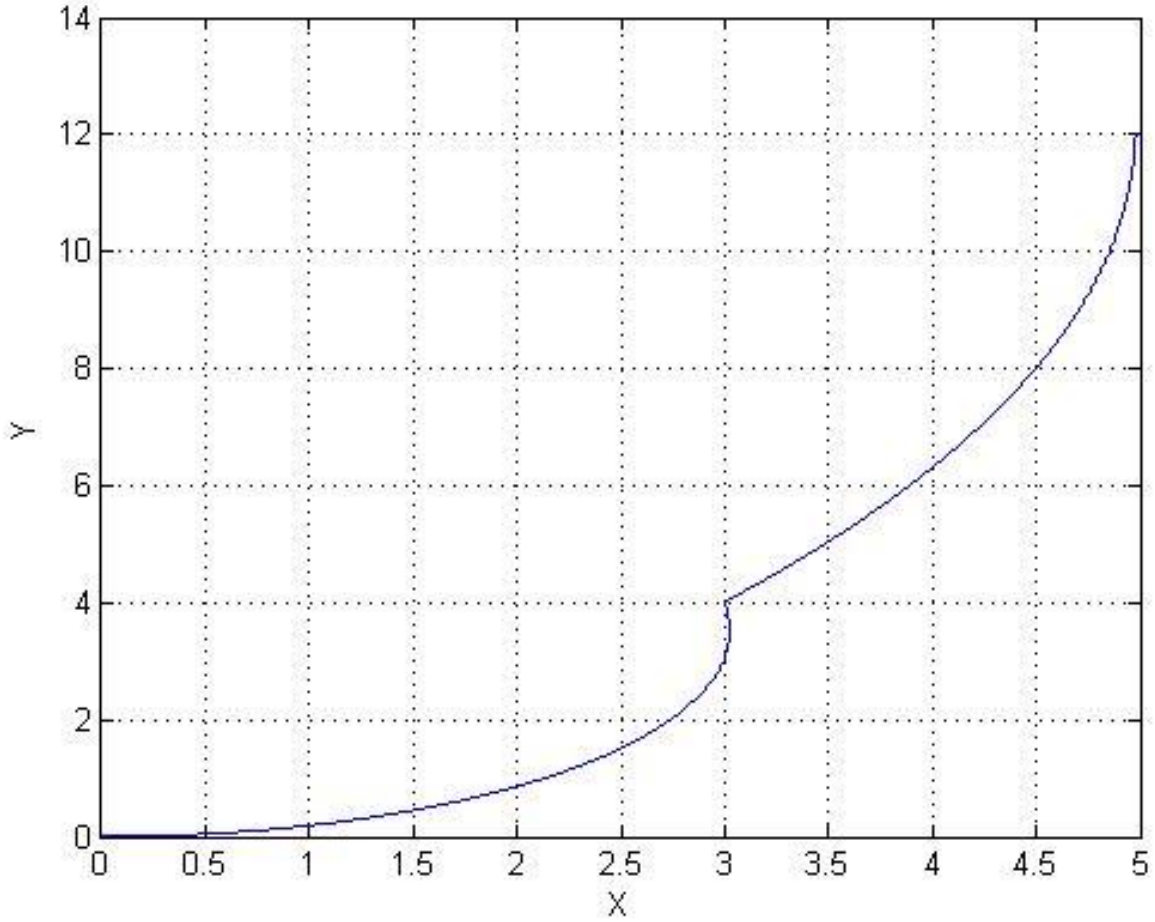
MATLAB Code



MATLAB Code

```
figure
Theta = cumtrapz(T,W);
D = cumtrapz(T,V);
X = D.*cos(Theta);
Y = D.*sin(Theta);
plot(X,Y)
grid
xlabel('X')
ylabel('Y')
```

MATLAB Code



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Thanks