CASE 1

Fix values

```
vt=40:60;
v1=0;
V2=60:130;
V3=60:130;
V4=0;
f2=30:90;
f4=30:90;



% %car1
% combns = Combinations(vt,v1);
% a= combns(:,1);
% b= combns(:,2);
% if a==b
%     Rv1=0;
% else
%     Rv1= RV_1(combns(:,1),combns(:,2));
% end
%
%
% %car2
% combns = Combinations(Vt*sind(f2),v2);
% a= combns(:,1);
% b= combns(:,2);
% if a==b
%     Rv2=0;
% else
%     Rv2= RV_1(combns(:,1),combns(:,2));
% end
%
%
% %car3
% combns = Combinations(vt,v3);
% a= combns(:,1);
% b= combns(:,2);
% if a==b
%     Rv3=0;
% else
%     Rv3= RV_1(combns(:,1),combns(:,2));
% end
%
%
% %car4
% combns = Combinations(Vt*sind(f4),v4);
% a= combns(:,1);
% b= combns(:,2);
% if a==b
%     Rv4=0;
% else
```

```
%     Rv4= RV_1(combns(:,1),combns(:,2));
% end


% Rv1=Vt-v1
% % at V1=0
% Rv1=Vt

%car1
combns = Combinations(vt,v1);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv1=0;
else
    Rv1= RV_1(combns(:,1),combns(:,2));
end


% Rv2=V2-Vt*sind(f2)

%car2
combns = Combinations(AngleCombinations(vt,f2),V2);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv2=0;
else
    Rv2= RV_1(combns(:,1),combns(:,2))
end
```

```
Rv2 = 90951×1
   40.0000
   39.5000
   39.0000
   38.5000
   38.0000
   37.5000
   37.0000
   36.5000
   36.0000
   35.5000
     ⋮
     ⋮
```

```
% Rv3=V3-Vt

%car3
combns = Combinations(vt,V3);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv3=0;
else
```

```
    Rv3= RV_1(combns(:,1),combns(:,2));
end



% Rv4 =Vt*sind(f4)-V4

%car4
combns = Combinations(AngleCombinations(vt,f4),V4);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv4=0;
else
    Rv4= RV_1(combns(:,1),combns(:,2))
end
```

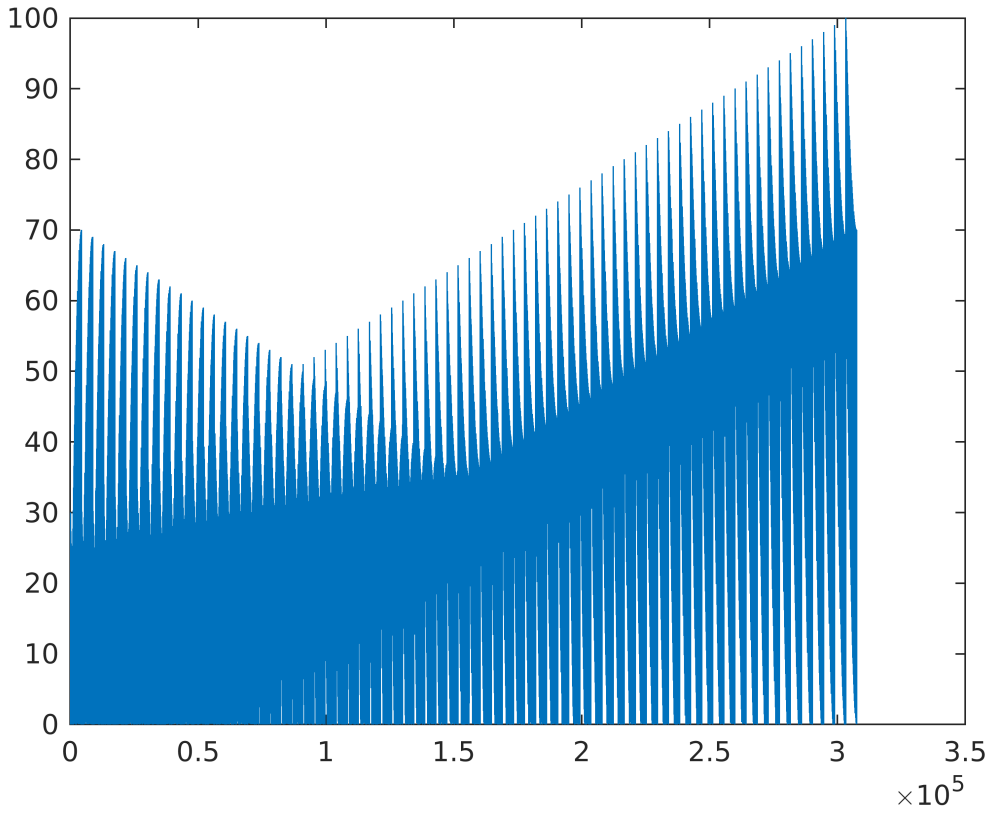
```
Rv4 = 1281×1
   20.0000
   20.5000
   21.0000
   21.5000
   22.0000
   22.5000
   23.0000
   23.5000
   24.0000
   24.5000
     ⋮
```

```
% at V4=0
% Rv4=Vt*sind(f4)
%
% % In case of impact from object 3 (with velocity V3)
% Rv3=V3-Vt
% % Car T tends to move at speed of V3 avoiding impact, making relative speed zero i.e.
% % Hence
% Rv3=0

% Then the impact with other bodies initiates due to acceleration to avoid impact from
% According to relative speeds the impact should be initiated. As relative speed is mor
% As
% V3=Vt

% Rv2=V2-V3*sind(f2)

% Rv2=V2-Vt*sind(f2)

clear Rv2
clear Rv4

%car2
combns = Combinations(AngleCombinations(V3,f2),V2);
```

```
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv2=0;
else
    Rv2= RV_1(combns(:,1),combns(:,2))
end
```

```
Rv2 = 307501×1
   30.0000
   29.5000
   29.0000
   28.5000
   28.0000
   27.5000
   27.0000
   26.5000
   26.0000
   25.5000
     ⋮
```

```
t=1:307501;
plot(t,Rv2)
xlim([0 350000])
ylim([0.0 100.0])
```

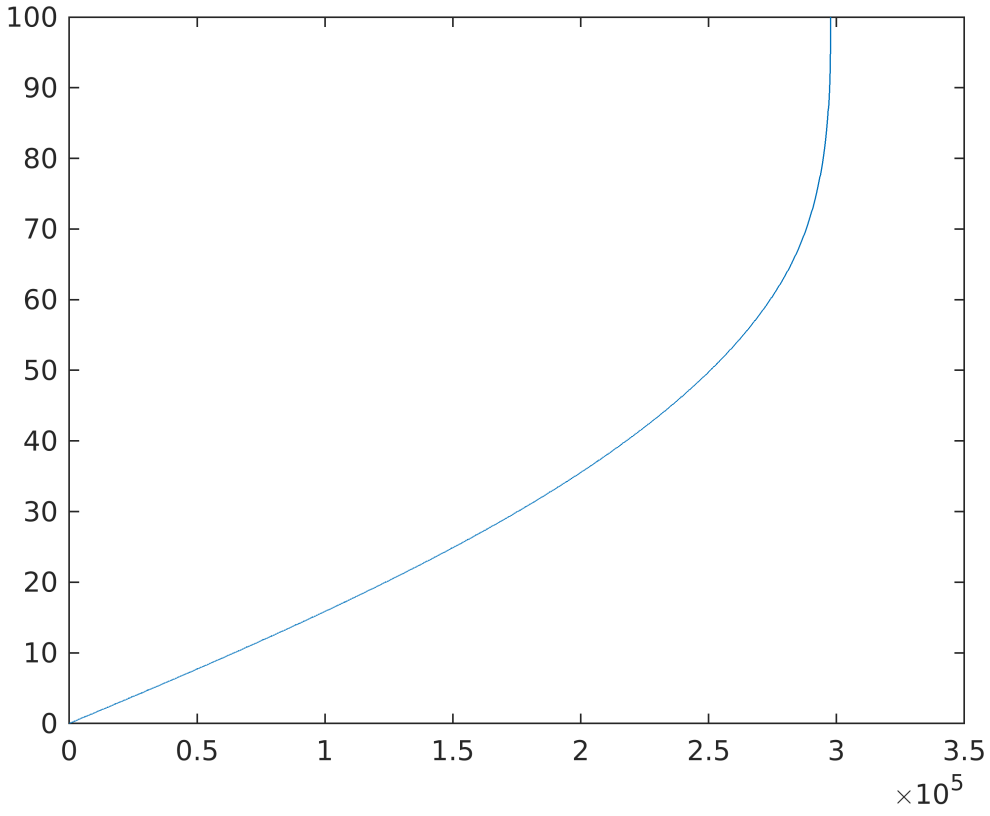



```
%unique values of Rv2
```

```
Rv22=unique(Rv2)
```

```
Rv22 = 297620×1
         0
    0.0001
    0.0003
    0.0004
    0.0006
    0.0008
    0.0009
    0.0012
    0.0013
    0.0015
     ⋮
```

```
t=1:297620;
plot(t,Rv22)
xlim([0 350000])
ylim([0.0 100.0])
```

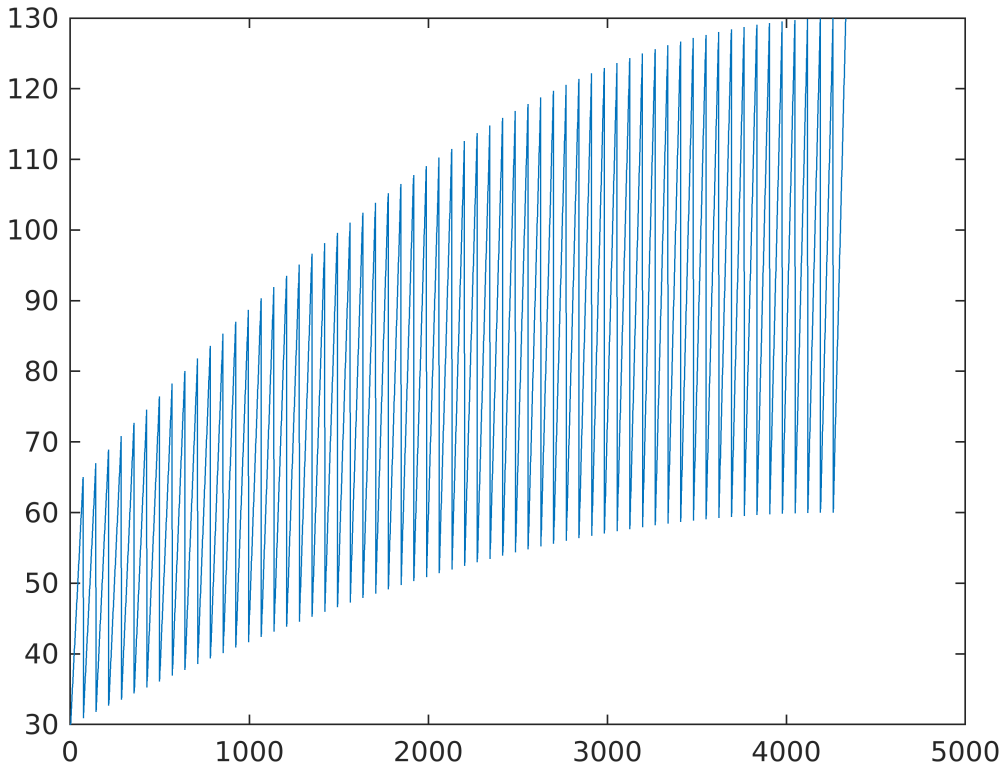



```
% Rv4 =V3*sind(f4)


%car4
combns = Combinations(AngleCombinations(V3,f4),V4);
a= combns(:,1);
```

```
b= combns(:,2);
if a==b
    Rv4=0;
else
    Rv4= RV_1(combns(:,1),combns(:,2))
end
```

```
Rv4 = 4331×1
   30.0000
   30.5000
   31.0000
   31.5000
   32.0000
   32.5000
   33.0000
   33.5000
   34.0000
   34.5000
     ⋮
```

```
t=1:4331;
plot(t,Rv4)
xlim([0 5000])
ylim([30.0 130.0])
```

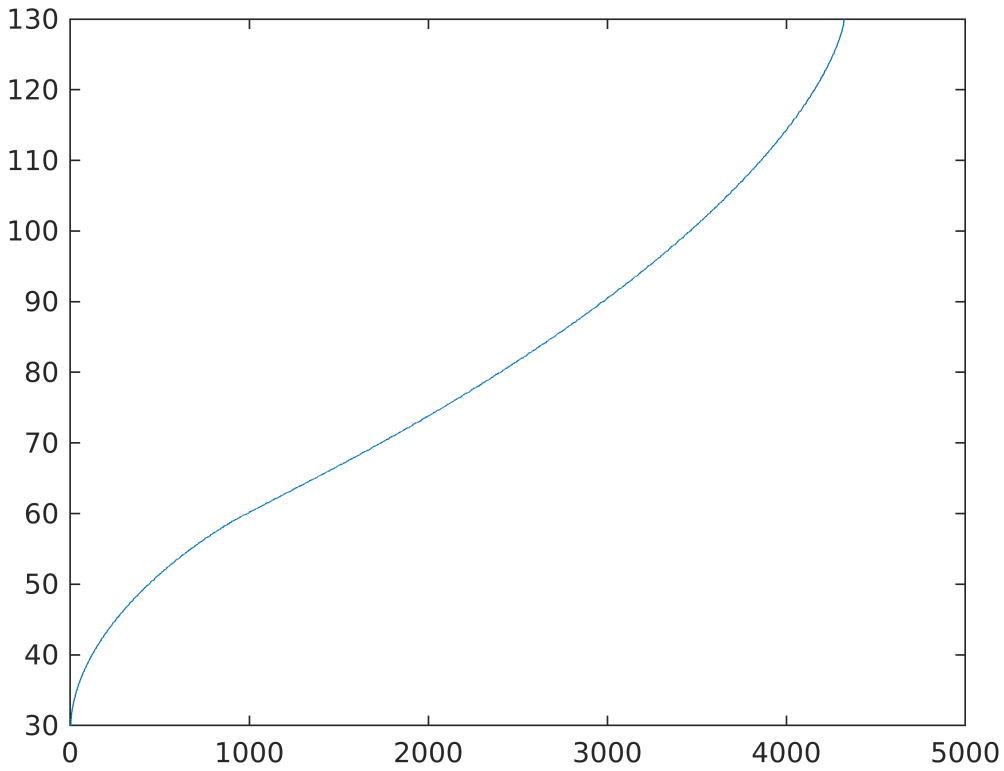



```
%unique values of Rv4
```

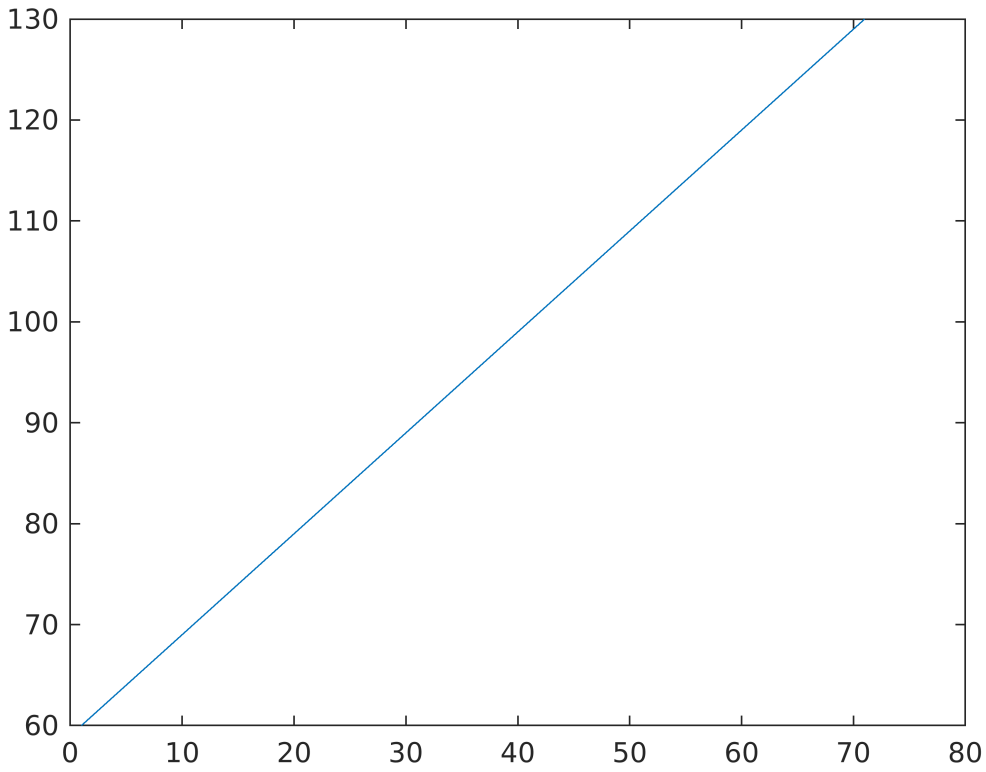
```
Rv44=unique(Rv4)
```

```
Rv44 = 4325×1
   30.0000
   30.5000
   30.9023
   31.0000
   31.4173
   31.5000
   31.7952
   31.9324
   32.0000
   32.3251
      ⋮
```

```
t=1:4325;
plot(t,Rv44)
xlim([0 5000])
ylim([30.0 130.0])
```




```
t=1:71;
plot(t,V3)
xlim([0.0 80.0])
ylim([60.0 130.0])
```




```
%Rv222 is matrix of same length with Rv4
Rv222=Rv2(1:length(Rv4))
```

```
Rv222 = 4331×1
   30.0000
   29.5000
   29.0000
   28.5000
   28.0000
   27.5000
   27.0000
   26.5000
   26.0000
   25.5000
     ⋮
```

```
t=1:4331;
plot(t,Rv222)
yyaxis right
plot(t,Rv4)



% Hence to give impact preference, the impact of lower damage to the car should be init
% Hence Algorithm should follow

for i=1:length(V3)
```

```
    a1=unique(Rv2(i))

    b1=unique(V3(i))

    c1=unique(Rv4(i))

    m1=min(a1,b1);
    m2=min(a1,c1);
    m3=min(c1,b1);

    if m1<m2 && m1<m3
        Impact=m1
    elseif m2<m1 && m2<m3
        Impact=m2
    else
        Impact=m3
    end
end
```

```
a1 = 30
b1 = 60
c1 = 30
Impact = 30
a1 = 29.5000
b1 = 61
c1 = 30.5000
Impact = 30.5000
a1 = 29
b1 = 62
c1 = 31
Impact = 31
a1 = 28.5000
b1 = 63
c1 = 31.5000
Impact = 31.5000
a1 = 28
b1 = 64
c1 = 32
Impact = 32
a1 = 27.5000
b1 = 65
c1 = 32.5000
Impact = 32.5000
a1 = 27
b1 = 66
c1 = 33
Impact = 33
a1 = 26.5000
b1 = 67
c1 = 33.5000
Impact = 33.5000
a1 = 26
b1 = 68
c1 = 34
Impact = 34
a1 = 25.5000
b1 = 69
c1 = 34.5000
Impact = 34.5000
a1 = 25
b1 = 70
```

```
c1 = 35
Impact = 35
a1 = 24.5000
b1 = 71
c1 = 35.5000
Impact = 35.5000
a1 = 24
b1 = 72
c1 = 36
Impact = 36
a1 = 23.5000
b1 = 73
c1 = 36.5000
Impact = 36.5000
a1 = 23
b1 = 74
c1 = 37
Impact = 37
a1 = 22.5000
b1 = 75
c1 = 37.5000
Impact = 37.5000
a1 = 22
b1 = 76
c1 = 38
Impact = 38
a1 = 21.5000
b1 = 77
c1 = 38.5000
Impact = 38.5000
a1 = 21
b1 = 78
c1 = 39
Impact = 39
a1 = 20.5000
b1 = 79
c1 = 39.5000
Impact = 39.5000
a1 = 20
b1 = 80
c1 = 40
Impact = 40
a1 = 19.5000
b1 = 81
c1 = 40.5000
Impact = 40.5000
a1 = 19
b1 = 82
c1 = 41
Impact = 41
a1 = 18.5000
b1 = 83
c1 = 41.5000
Impact = 41.5000
a1 = 18
b1 = 84
c1 = 42
Impact = 42
a1 = 17.5000
b1 = 85
c1 = 42.5000
Impact = 42.5000
a1 = 17
b1 = 86
```

```
c1 = 43
Impact = 43
a1 = 16.5000
b1 = 87
c1 = 43.5000
Impact = 43.5000
a1 = 16
b1 = 88
c1 = 44
Impact = 44
a1 = 15.5000
b1 = 89
c1 = 44.5000
Impact = 44.5000
a1 = 15
b1 = 90
c1 = 45
Impact = 45
a1 = 14.5000
b1 = 91
c1 = 45.5000
Impact = 45.5000
a1 = 14
b1 = 92
c1 = 46
Impact = 46
a1 = 13.5000
b1 = 93
c1 = 46.5000
Impact = 46.5000
a1 = 13
b1 = 94
c1 = 47
Impact = 47
a1 = 12.5000
b1 = 95
c1 = 47.5000
Impact = 47.5000
a1 = 12
b1 = 96
c1 = 48
Impact = 48
a1 = 11.5000
b1 = 97
c1 = 48.5000
Impact = 48.5000
a1 = 11
b1 = 98
c1 = 49
Impact = 49
a1 = 10.5000
b1 = 99
c1 = 49.5000
Impact = 49.5000
a1 = 10
b1 = 100
c1 = 50
Impact = 50
a1 = 9.5000
b1 = 101
c1 = 50.5000
Impact = 50.5000
a1 = 9
b1 = 102
```

```
c1 = 51
Impact = 51
a1 = 8.5000
b1 = 103
c1 = 51.5000
Impact = 51.5000
a1 = 8
b1 = 104
c1 = 52
Impact = 52
a1 = 7.5000
b1 = 105
c1 = 52.5000
Impact = 52.5000
a1 = 7
b1 = 106
c1 = 53
Impact = 53
a1 = 6.5000
b1 = 107
c1 = 53.5000
Impact = 53.5000
a1 = 6
b1 = 108
c1 = 54
Impact = 54
a1 = 5.5000
b1 = 109
c1 = 54.5000
Impact = 54.5000
a1 = 5
b1 = 110
c1 = 55
Impact = 55
a1 = 4.5000
b1 = 111
c1 = 55.5000
Impact = 55.5000
a1 = 4
b1 = 112
c1 = 56
Impact = 56
a1 = 3.5000
b1 = 113
c1 = 56.5000
Impact = 56.5000
a1 = 3
b1 = 114
c1 = 57
Impact = 57
a1 = 2.5000
b1 = 115
c1 = 57.5000
Impact = 57.5000
a1 = 2
b1 = 116
c1 = 58
Impact = 58
a1 = 1.5000
b1 = 117
c1 = 58.5000
Impact = 58.5000
a1 = 1
b1 = 118
```

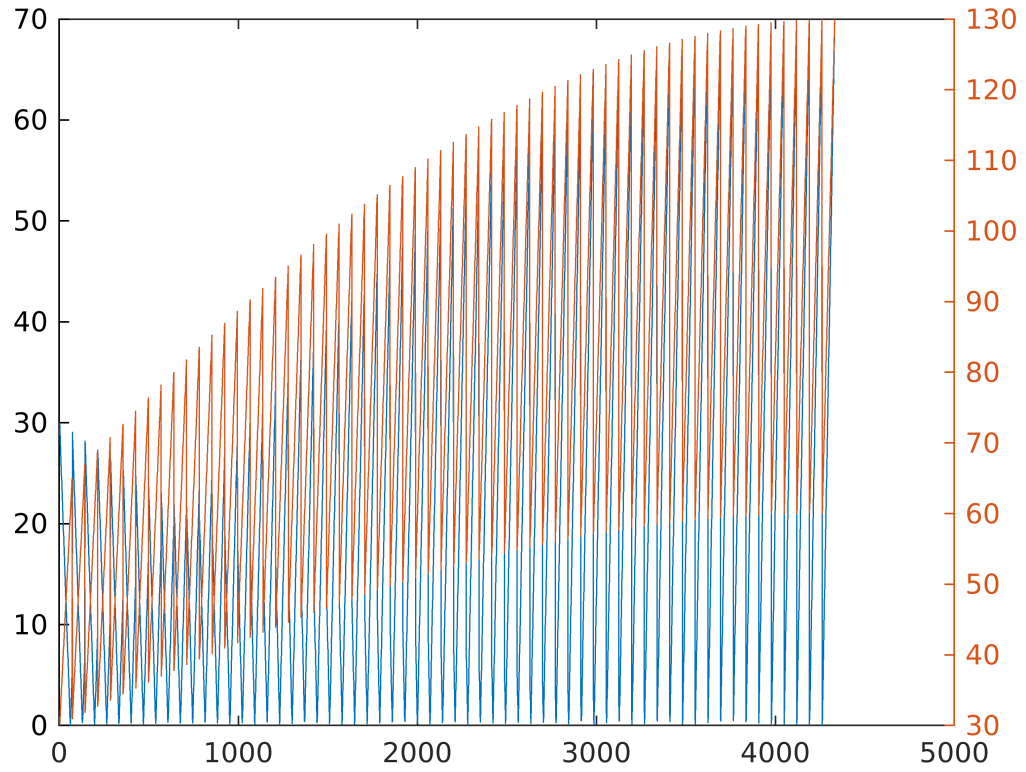
```
c1 = 59
Impact = 59
a1 = 0.5000
b1 = 119
c1 = 59.5000
Impact = 59.5000
a1 = 0
b1 = 120
c1 = 60
Impact = 60
a1 = 0.5000
b1 = 121
c1 = 60.5000
Impact = 60.5000
a1 = 1
b1 = 122
c1 = 61
Impact = 61
a1 = 1.5000
b1 = 123
c1 = 61.5000
Impact = 61.5000
a1 = 2
b1 = 124
c1 = 62
Impact = 62
a1 = 2.5000
b1 = 125
c1 = 62.5000
Impact = 62.5000
a1 = 3
b1 = 126
c1 = 63
Impact = 63
a1 = 3.5000
b1 = 127
c1 = 63.5000
Impact = 63.5000
a1 = 4
b1 = 128
c1 = 64
Impact = 64
a1 = 4.5000
b1 = 129
c1 = 64.5000
Impact = 64.5000
a1 = 5
b1 = 130
c1 = 65
Impact = 65
```

CASE 2

```
% Fix values

vt=40:60;
v1=0;
V2=60:130;
V3=60:130;
V4=60:130;
f2=30:90;
f4=30:90;


% iteration
% Rv1=Vt-v1

% Rv2=V2-Vt*sind(f2)

% Rv3=V3-Vt
% in case of impact with 3 with v3

% Rv3=V3-Vt


% V3=Vt
% Then the impact with other bodies initiates due to acceleration to avoid impact from
% According to relative speeds the impact should be initiated. As relative speed is mor
% collision damage would be more. As there is less impact speed there will be less dama
% (According Momentum transfer law)

% Rv2=V2-V3*sind(f2)
%car2
combns = Combinations(AngleCombinations(V3,f2),V2);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv2=0;
else
    Rv2= RV_1(combns(:,1),combns(:,2))
end
```

```
Rv2 = 307501×1
   30.0000
   29.5000
   29.0000
   28.5000
   28.0000
   27.5000
   27.0000
   26.5000
   26.0000
   25.5000
     ⋮
```

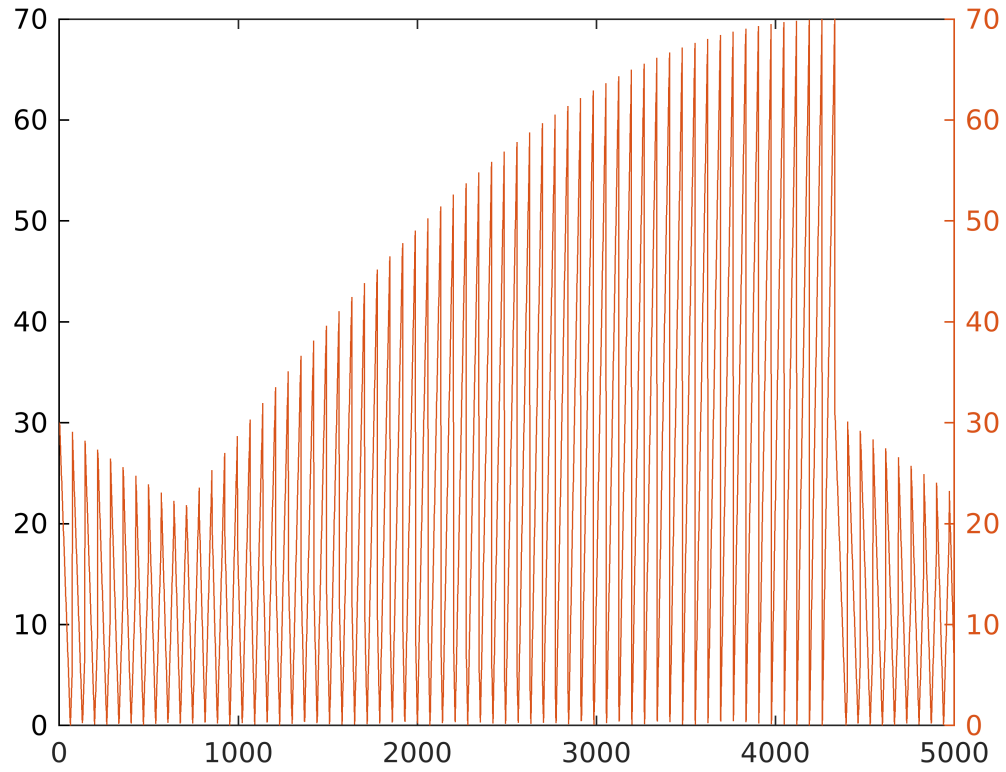
```
t=1:307501;
plot(t,Rv2)
```




```
xlim([0 5000])
ylim([0.0 100.0])

%unique values of Rv2
Rv22=unique(Rv2)
```

```
Rv22 = 297620×1
         0
    0.0001
    0.0003
    0.0004
    0.0006
    0.0008
    0.0009
    0.0012
    0.0013
    0.0015
     ⋮
```

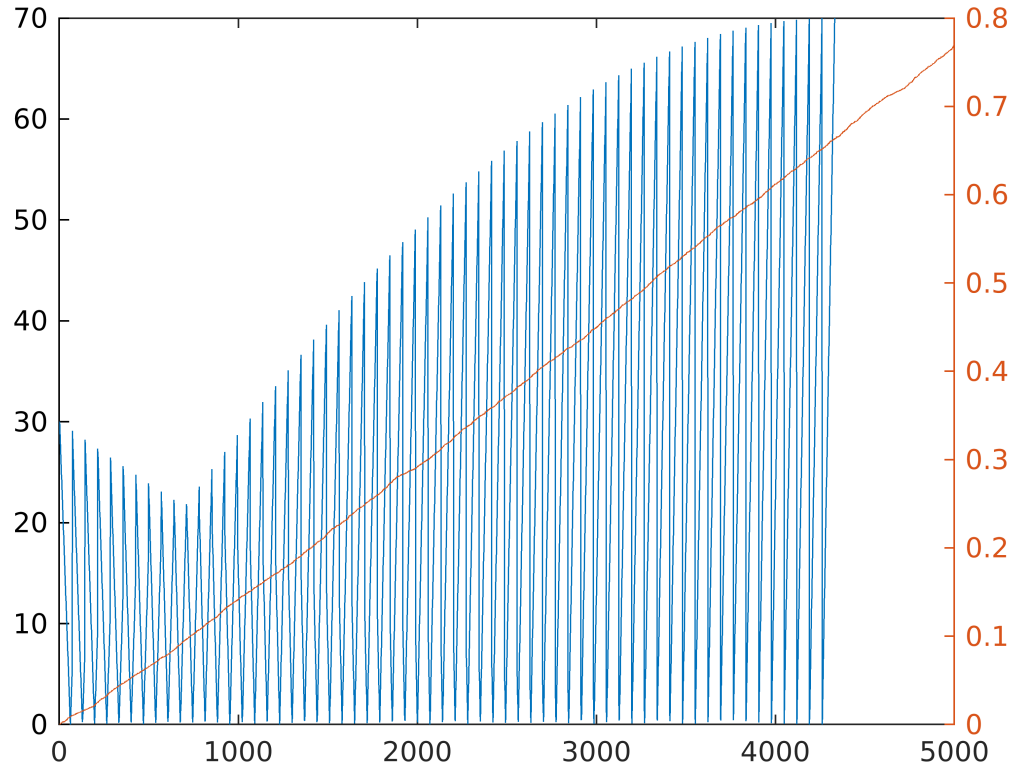
```
t=1:297620;
plot(t,Rv22)
```




```
xlim([0 5000])
ylim([0.0 100.0])


% Rv4 =abs(V3*sind(f4)-V3)
%car4
combns = Combinations(AngleCombinations(V3,f4),V4);
a= combns(:,1);
b= combns(:,2);
if a==b
    Rv4=0;
else
    Rv4= RV_1(combns(:,1),combns(:,2))
end
```

```
Rv4 = 307501×1
   30.0000
   29.5000
   29.0000
   28.5000
   28.0000
   27.5000
   27.0000
   26.5000
   26.0000
   25.5000
     ⋮
```

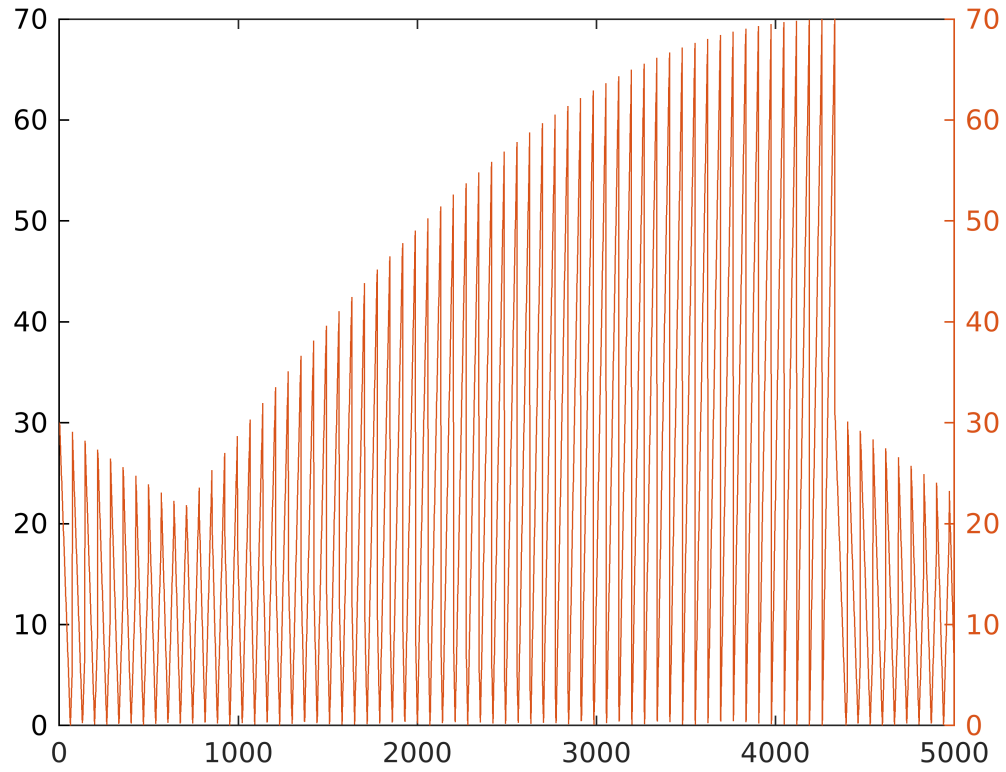
```
t=1:307501;
plot(t,Rv4)
```



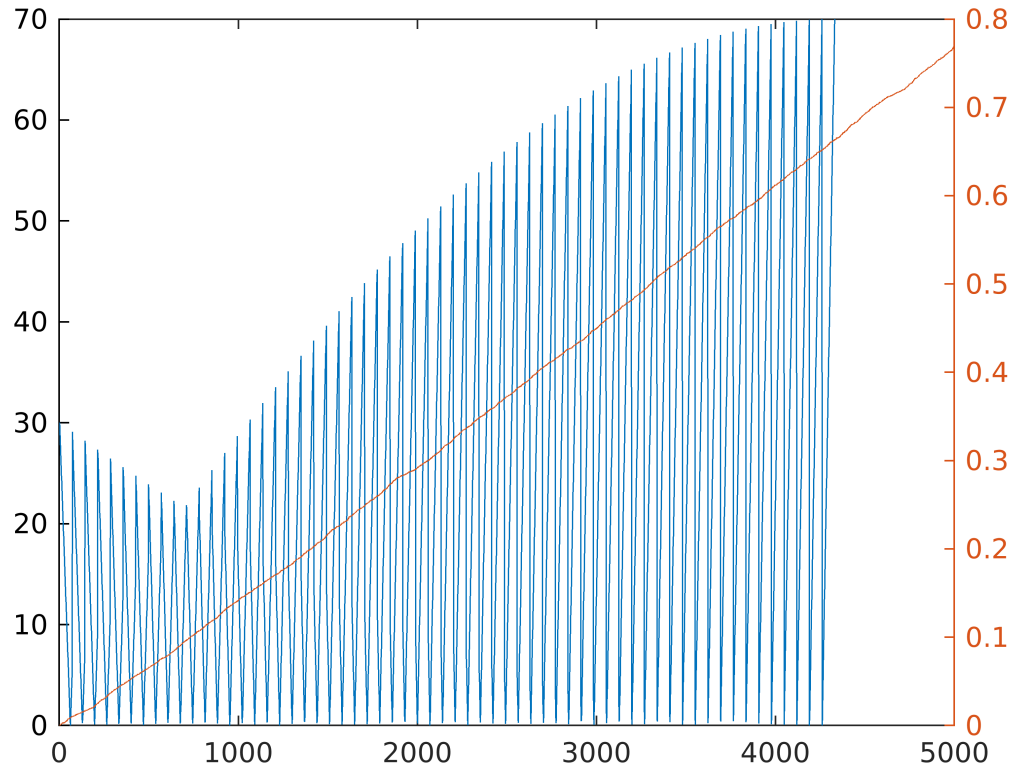

```
xlim([0 5000])
ylim([30.0 130.0])


%unique values of Rv4
Rv44=unique(Rv4)
```

```
Rv44 = 297620×1
         0
    0.0001
    0.0003
    0.0004
    0.0006
    0.0008
    0.0009
    0.0012
    0.0013
    0.0015
     ⋮
```

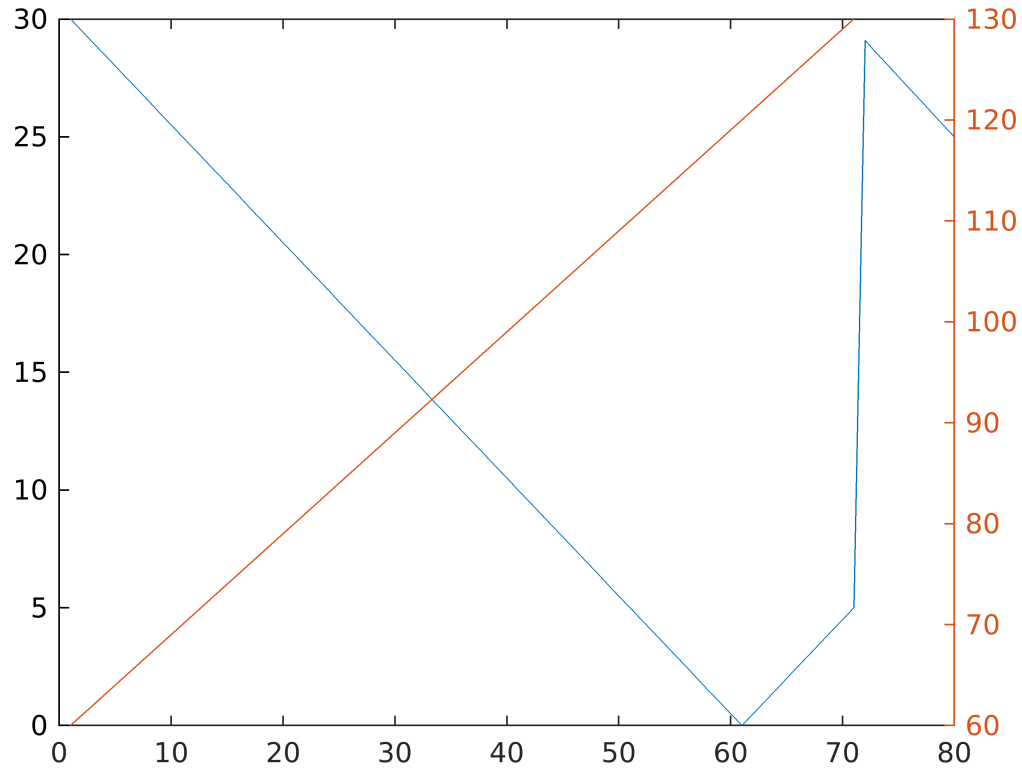
```
t=1:297620;
plot(t,Rv44)
```




```
xlim([0 5000])
ylim([30.0 130.0])


%car3 (V3)
t=1:71;
plot(t,V3)
```




```
xlim([0.0 80.0])
ylim([60.0 130.0])
```




```
% Hence to give impact preference, the impact of lower damage to the car should be init
% Hence Algorithm should follow
% m= [Rv2 V3 Rv4]
% min(m)

for i=1:length(V3)

 a1=unique(Rv2(i))
 b1=unique(V3(i))

 c1=unique(Rv4(i))

 m1=min(a1,b1);
 m2=min(a1,c1);
 m3=min(c1,b1);

 if m1<m2 && m1<m3
     Impact=m1

 elseif m2<m1 && m2<m3
      Impact=m2

 else
     Impact=m3
```

```
 end

end
```

```
a1 = 30
b1 = 60
c1 = 30
Impact = 30
a1 = 29.5000
b1 = 61
c1 = 29.5000
Impact = 29.5000
a1 = 29
b1 = 62
c1 = 29
Impact = 29
a1 = 28.5000
b1 = 63
c1 = 28.5000
Impact = 28.5000
a1 = 28
b1 = 64
c1 = 28
Impact = 28
a1 = 27.5000
b1 = 65
c1 = 27.5000
Impact = 27.5000
a1 = 27
b1 = 66
c1 = 27
Impact = 27
a1 = 26.5000
b1 = 67
c1 = 26.5000
Impact = 26.5000
a1 = 26
b1 = 68
c1 = 26
Impact = 26
a1 = 25.5000
b1 = 69
c1 = 25.5000
Impact = 25.5000
a1 = 25
b1 = 70
c1 = 25
Impact = 25
a1 = 24.5000
b1 = 71
c1 = 24.5000
Impact = 24.5000
a1 = 24
b1 = 72
c1 = 24
Impact = 24
a1 = 23.5000
b1 = 73
c1 = 23.5000
Impact = 23.5000
a1 = 23
b1 = 74
c1 = 23
Impact = 23
```

```
a1 = 22.5000
b1 = 75
c1 = 22.5000
Impact = 22.5000
a1 = 22
b1 = 76
c1 = 22
Impact = 22
a1 = 21.5000
b1 = 77
c1 = 21.5000
Impact = 21.5000
a1 = 21
b1 = 78
c1 = 21
Impact = 21
a1 = 20.5000
b1 = 79
c1 = 20.5000
Impact = 20.5000
a1 = 20
b1 = 80
c1 = 20
Impact = 20
a1 = 19.5000
b1 = 81
c1 = 19.5000
Impact = 19.5000
a1 = 19
b1 = 82
c1 = 19
Impact = 19
a1 = 18.5000
b1 = 83
c1 = 18.5000
Impact = 18.5000
a1 = 18
b1 = 84
c1 = 18
Impact = 18
a1 = 17.5000
b1 = 85
c1 = 17.5000
Impact = 17.5000
a1 = 17
b1 = 86
c1 = 17
Impact = 17
a1 = 16.5000
b1 = 87
c1 = 16.5000
Impact = 16.5000
a1 = 16
b1 = 88
c1 = 16
Impact = 16
a1 = 15.5000
b1 = 89
c1 = 15.5000
Impact = 15.5000
a1 = 15
b1 = 90
c1 = 15
Impact = 15
```

```
a1 = 14.5000
b1 = 91
c1 = 14.5000
Impact = 14.5000
a1 = 14
b1 = 92
c1 = 14
Impact = 14
a1 = 13.5000
b1 = 93
c1 = 13.5000
Impact = 13.5000
a1 = 13
b1 = 94
c1 = 13
Impact = 13
a1 = 12.5000
b1 = 95
c1 = 12.5000
Impact = 12.5000
a1 = 12
b1 = 96
c1 = 12
Impact = 12
a1 = 11.5000
b1 = 97
c1 = 11.5000
Impact = 11.5000
a1 = 11
b1 = 98
c1 = 11
Impact = 11
a1 = 10.5000
b1 = 99
c1 = 10.5000
Impact = 10.5000
a1 = 10
b1 = 100
c1 = 10
Impact = 10
a1 = 9.5000
b1 = 101
c1 = 9.5000
Impact = 9.5000
a1 = 9
b1 = 102
c1 = 9
Impact = 9
a1 = 8.5000
b1 = 103
c1 = 8.5000
Impact = 8.5000
a1 = 8
b1 = 104
c1 = 8
Impact = 8
a1 = 7.5000
b1 = 105
c1 = 7.5000
Impact = 7.5000
a1 = 7
b1 = 106
c1 = 7
Impact = 7
```

```
a1 = 6.5000
b1 = 107
c1 = 6.5000
Impact = 6.5000
a1 = 6
b1 = 108
c1 = 6
Impact = 6
a1 = 5.5000
b1 = 109
c1 = 5.5000
Impact = 5.5000
a1 = 5
b1 = 110
c1 = 5
Impact = 5
a1 = 4.5000
b1 = 111
c1 = 4.5000
Impact = 4.5000
a1 = 4
b1 = 112
c1 = 4
Impact = 4
a1 = 3.5000
b1 = 113
c1 = 3.5000
Impact = 3.5000
a1 = 3
b1 = 114
c1 = 3
Impact = 3
a1 = 2.5000
b1 = 115
c1 = 2.5000
Impact = 2.5000
a1 = 2
b1 = 116
c1 = 2
Impact = 2
a1 = 1.5000
b1 = 117
c1 = 1.5000
Impact = 1.5000
a1 = 1
b1 = 118
c1 = 1
Impact = 1
a1 = 0.5000
b1 = 119
c1 = 0.5000
Impact = 0.5000
a1 = 0
b1 = 120
c1 = 0
Impact = 0
a1 = 0.5000
b1 = 121
c1 = 0.5000
Impact = 0.5000
a1 = 1
b1 = 122
c1 = 1
Impact = 1
```

```
a1 = 1.5000
b1 = 123
c1 = 1.5000
Impact = 1.5000
a1 = 2
b1 = 124
c1 = 2
Impact = 2
a1 = 2.5000
b1 = 125
c1 = 2.5000
Impact = 2.5000
a1 = 3
b1 = 126
c1 = 3
Impact = 3
a1 = 3.5000
b1 = 127
c1 = 3.5000
Impact = 3.5000
a1 = 4
b1 = 128
c1 = 4
Impact = 4
a1 = 4.5000
b1 = 129
c1 = 4.5000
Impact = 4.5000
a1 = 5
b1 = 130
c1 = 5
Impact = 5
```