# **Molniya Orbits**

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```
In[414]:= Clear ["Global`*"]
In[543]: data0 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_0.dat", "Data"];
      data1 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_1.dat", "Data"];
      data2 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol__2.dat", "Data"];
      data3 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_3.dat", "Data"];
      data4 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_4.dat", "Data"];
      data5 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya data/orbits Mol 5.dat", "Data"];
      data6 = Import ["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_6.dat", "Data"];
      data7 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_7.dat", "Data"];
      data8 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_8.dat", "Data"];
      data9 = Import ["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_9.dat", "Data"];
      data10 = Import ["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_10.dat", "Data"];
      data11 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_11.dat", "Data"];
      data12 = Import ["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_12.dat", "Data"];
      data13 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya data/orbits Mol 13.dat", "Data"];
      data14 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_14.dat", "Data"];
      data15 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya data/orbits Mol_15.dat", "Data"];
      data16 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_16.dat", "Data"];
      data17 = Import ["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_17.dat", "Data"];
      data18 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya data/orbits Mol 18.dat", "Data"];
      data19 = Import["C:/Users/lefte/OneDrive/Desktop/Molniya_data/orbits_Mol_19.dat", "Data"];
```

```
2 astro4_Molniya.nb
```

```
In[563]:= avst0 = data0[[All, {1, 2}]];
         evst0 = data0[[All, {1, 3}]];
         ivst0 = data0[[All, {1, 4}]];
        Wvst0 = data0[[All, {1, 5}]];
         wvst0 = data0[[All, {1, 6}]];
         Wdotvst0 = data0[[All, {1, 7}]];
         wdotvst0 = data0[[All, {1, 8}]];
         ListLinePlot[avst0, PlotStyle → Blue, PlotLabel → "a vs t for i = 58",
          GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
         ListLinePlot[evst0, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "e vs t for i = 58",
          GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
         ListLinePlot[ivst0, PlotStyle → Blue, PlotLabel → "i vs t for i = 58",
          GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
         ListLinePlot [Wvst0, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 58",
           \label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic} \,, \;\; \texttt{Frame} \rightarrow \texttt{True} \,, \; \texttt{FrameLabel} \rightarrow \texttt{\{"t (sec)", "}\Omega \ (rad)"\}] 
         ListLinePlot [wvst0, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 58",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
         ListLinePlot[Wdotvst0, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega\)/dt vs t for i = 58",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\Omega/dt (rad/sec)"}
         ListLinePlot[wdotvst0, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 58",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
                                         a vs t for i = 58
            25 510
            25 509
            25 508
            25 507
Out[570]=
            25 506
            25 505
            25 504
                               1 \times 10^{7}
                                                             3 \times 10^{7}
                                              2 \times 10^{\circ}
                                              t (sec)
                                         e vs t for i = 58
            0.75135
            0.75130
         o 0.75125
Out[571]=
            0.75115
```

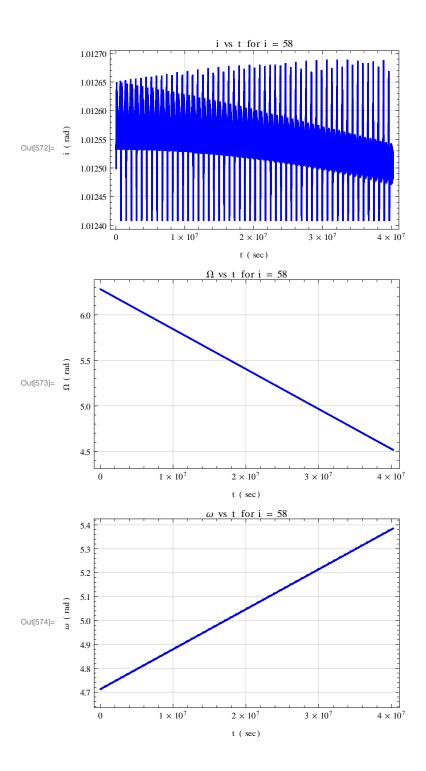
 $1 \times 10^{7}$ 

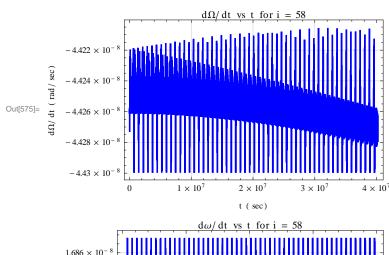
 $2 \times 10^{7}$ 

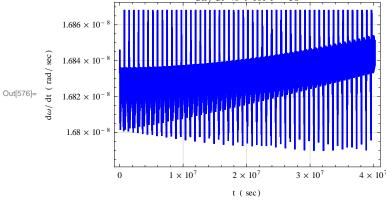
t (sec)

 $3 \times 10^{7}$ 

 $4 \times 10^{\circ}$ 







# i = 58.5

```
In[577]:= avst1 = data1[[All, {1, 2}]];
    evst1 = data1[[All, {1, 3}]];
    ivst1 = data1[[All, {1, 4}]];
    Wvst1 = data1[[All, {1, 5}]];
    wvst1 = data1[[All, {1, 6}]];
    Wdotvst1 = data1[[All, {1, 7}]];
    wdotvst1 = data1[[All, {1, 8}]];
```

```
ListLinePlot [avst1, PlotStyle → Blue, PlotLabel → "a vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "a (km)"}]

ListLinePlot [evst1, PlotStyle → Blue, PlotLabel → "e vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "e"}]

ListLinePlot [ivst1, PlotStyle → Blue, PlotLabel → "i vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "i (rad)"}]

ListLinePlot [Wvst1, PlotStyle → Blue, PlotLabel → "\Omega vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "\Omega (rad)"}]

ListLinePlot [wvst1, PlotStyle → Blue, PlotLabel → "\omega vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "\omega (rad)"}]

ListLinePlot [Wdotvst1, PlotStyle → Blue, PlotLabel → "d\Omega / dt vs t for i = 58.5",

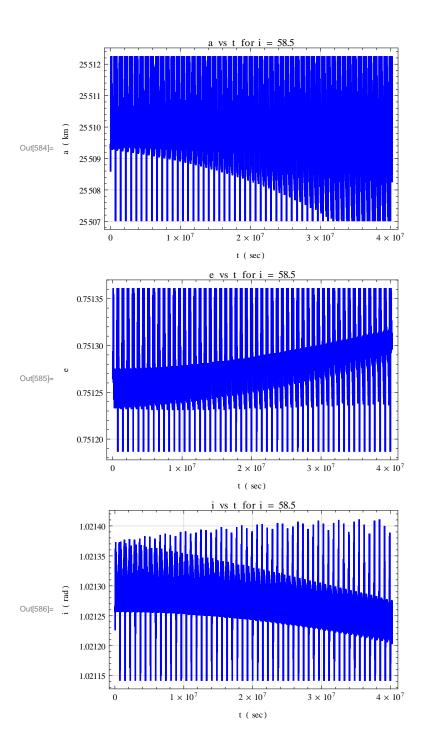
GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "d\Omega / dt (rad/sec)"}]

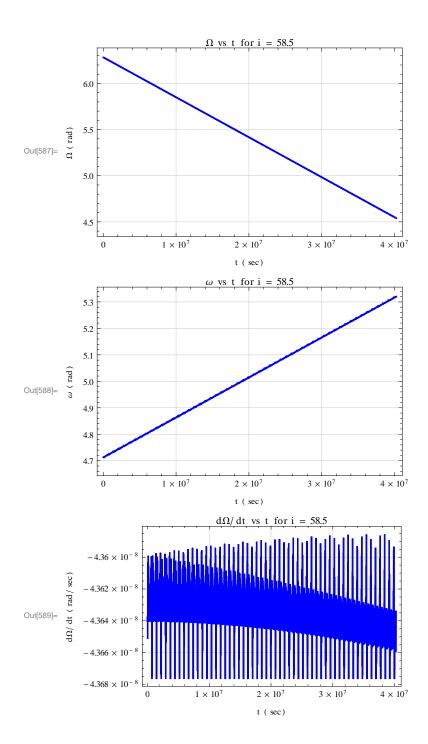
ListLinePlot [wdotvst1, PlotStyle → Blue, PlotLabel → "d\Omega / dt vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "d\Omega / dt vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "d\Omega / dt vs t for i = 58.5",

GridLines → Automatic, Frame → True, FrameLabel → "d\Omega / dt vs t for i = 58.5",
```

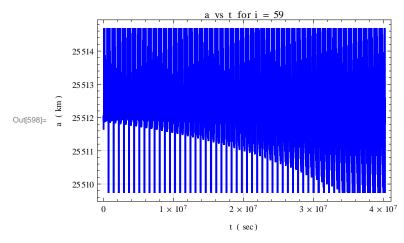


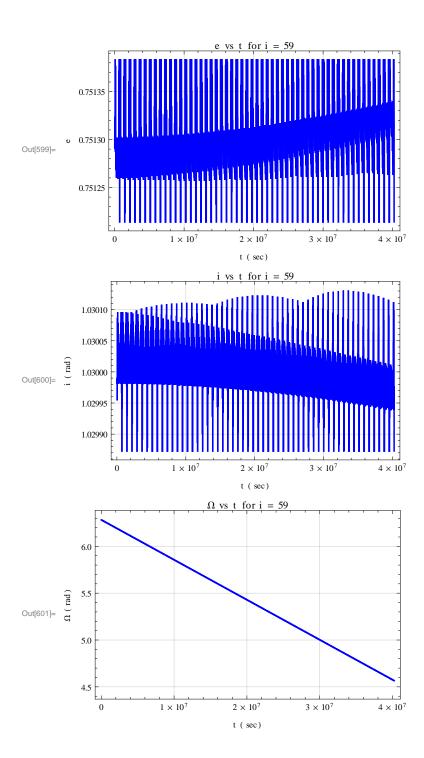


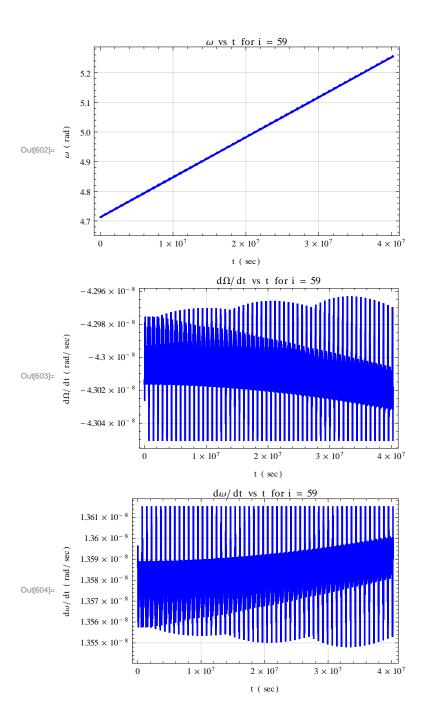
## ■ i = 59

in[591]:= avst2 = data2[[All, {1, 2}]];
 evst2 = data2[[All, {1, 3}]];
 ivst2 = data2[[All, {1, 4}]];
 Wvst2 = data2[[All, {1, 5}]];
 wvst2 = data2[[All, {1, 6}]];
 Wdotvst2 = data2[[All, {1, 7}]];
 wdotvst2 = data2[[All, {1, 7}]];

ListLinePlot[avst2, PlotStyle → Blue, PlotLabel → "a vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "a (km)"}]
ListLinePlot[evst2, PlotStyle → Blue, PlotLabel → "e vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "e"}]
ListLinePlot[ivst2, PlotStyle → Blue, PlotLabel → "i vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "i (rad)"}]
ListLinePlot[Wvst2, PlotStyle → Blue, PlotLabel → "Ω vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "Ω (rad)"}]
ListLinePlot[wvst2, PlotStyle → Blue, PlotLabel → "ω vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "ω (rad)"}]
ListLinePlot[Wdotvst2, PlotStyle → Blue, PlotLabel → "dΩ/dt vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "dΩ/dt (rad/sec)"}]
ListLinePlot[wdotvst2, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "dΩ/dt (rad/sec)"}]
ListLinePlot[wdotvst2, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 59",
 GridLines → Automatic, Frame → True, FrameLabel → {"t (sec)", "dω/dt (rad/sec)"}]

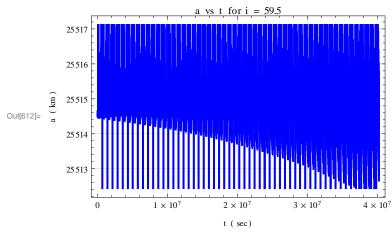


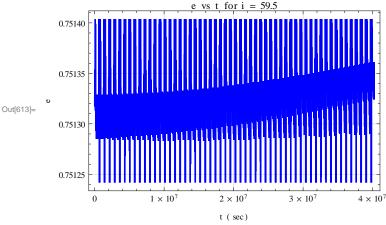


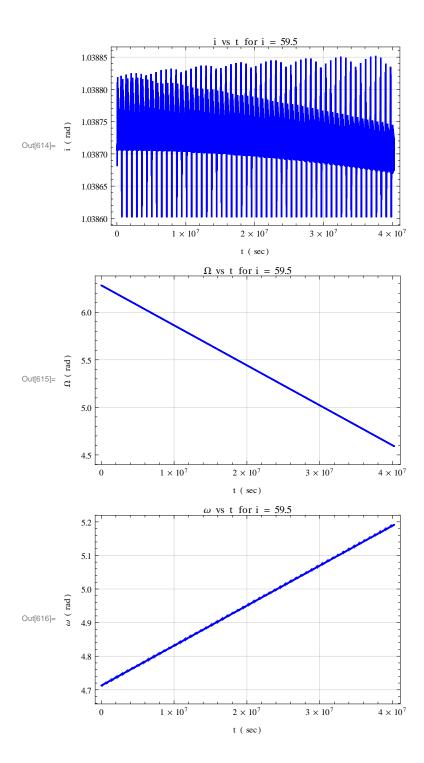


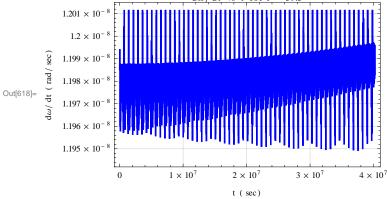
#### = i = 59.5

```
in[605]:= avst3 = data3[[All, {1, 2}]];
       evst3 = data3[[All, {1, 3}]];
       ivst3 = data3[[All, {1, 4}]];
       Wvst3 = data3[[All, {1, 5}]];
       wvst3 = data3[[All, {1, 6}]];
       Wdotvst3 = data3[[All, {1, 7}]];
       wdotvst3 = data3[[All, {1, 8}]];
       ListLinePlot[avst3, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 59.5",
        GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
       ListLinePlot[evst3, PlotStyle → Blue, PlotLabel → "e vs t for i = 59.5",
        \label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic}\,\,,\,\,\, \texttt{Frame} \rightarrow \texttt{True}\,\,,\,\, \texttt{FrameLabel}\,\, -> \, \{\texttt{"t}\,\,\,(\,\texttt{sec}\,)\,\texttt{",}\,\,\texttt{"e}\,\texttt{"}\}]
       ListLinePlot[ivst3, PlotStyle → Blue, PlotLabel → "i vs t for i = 59.5",
        GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
       ListLinePlot[Wvst3, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 59.5",
        GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
       ListLinePlot[wvst3, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 59.5",
        GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "\omega (rad)"}]
       ListLinePlot[Wdotvst3, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega/dt vs t for i = 59.5",
        ListLinePlot[wdotvst3, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 59.5",
        GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
```









# ■ i = 60

In[619]:= avst4 = data4[[All, {1, 2}]];
 evst4 = data4[[All, {1, 3}]];
 ivst4 = data4[[All, {1, 4}]];
 Wvst4 = data4[[All, {1, 5}]];
 wvst4 = data4[[All, {1, 6}]];
 Wdotvst4 = data4[[All, {1, 7}]];
 wdotvst4 = data4[[All, {1, 8}]];

ListLinePlot[avst4, PlotStyle → Blue, PlotLabel → "a vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "a (km)"}]

ListLinePlot[evst4, PlotStyle → Blue, PlotLabel → "e vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "e"}]

ListLinePlot[ivst4, PlotStyle → Blue, PlotLabel → "i vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "i (rad)"}]

ListLinePlot[Wvst4, PlotStyle → Blue, PlotLabel → "\Omega vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "\Omega (rad)"}]

ListLinePlot[wvst4, PlotStyle → Blue, PlotLabel → "\omega vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "\omega (rad)"}]

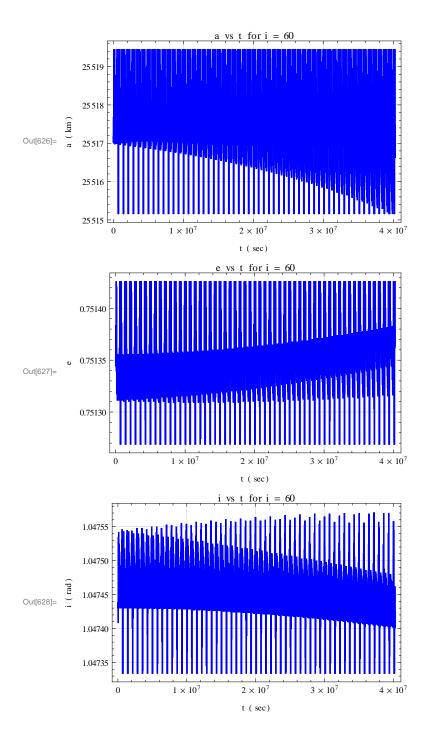
ListLinePlot[Wdotvst4, PlotStyle → Blue, PlotLabel → "d\Omega/dt vs t for i = 60",

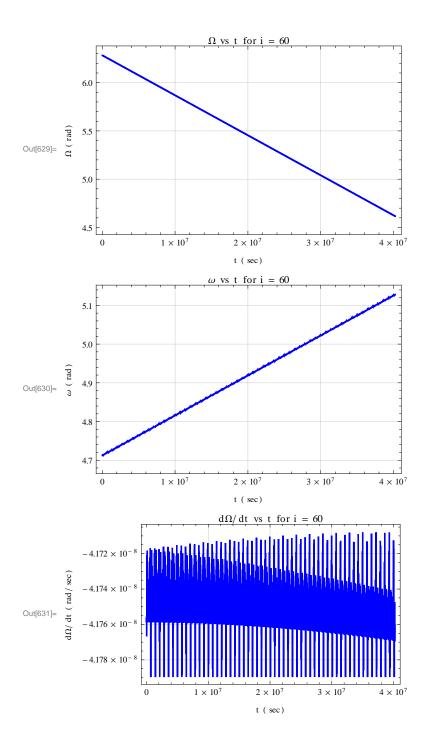
GridLines → Automatic, Frame → True, FrameLabel → "t (sec)", "d\Omega/dt (rad/sec)"}]

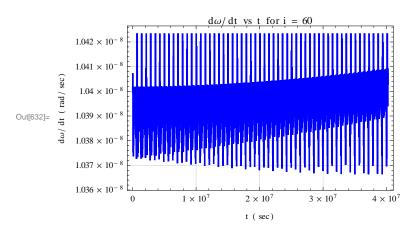
ListLinePlot[wdotvst4, PlotStyle → Blue, PlotLabel → "d\Omega/dt vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "d\Omega/dt vs t for i = 60",

GridLines → Automatic, Frame → True, FrameLabel → "d\Omega/dt vs t for i = 60",



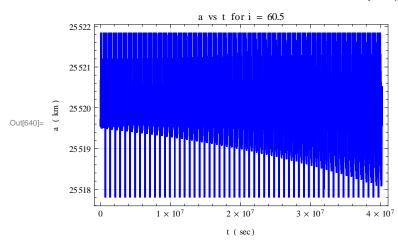


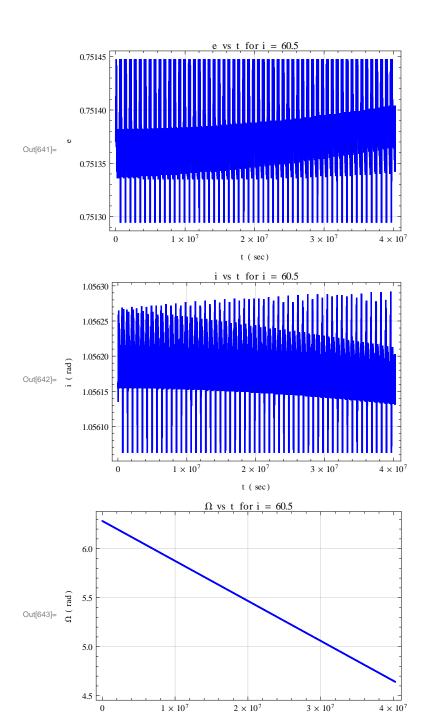


#### = i = 60.5

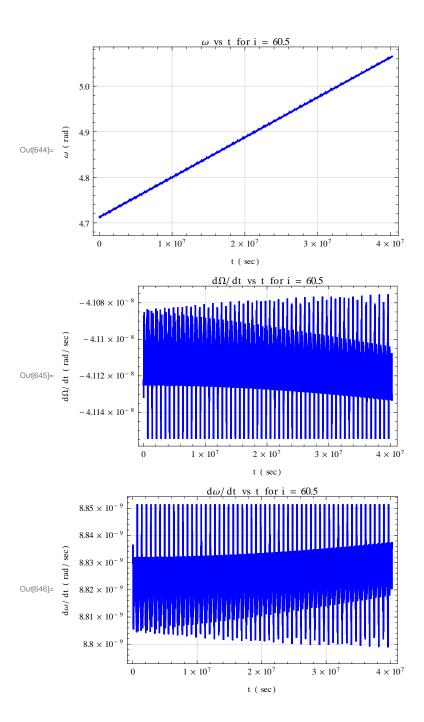
```
In[633]:= avst5 = data5[[All, {1, 2}]];
      evst5 = data5[[All, {1, 3}]];
      ivst5 = data5[[All, {1, 4}]];
      Wvst5 = data5[[All, {1, 5}]];
      wvst5 = data5[[All, {1, 6}]];
      Wdotvst5 = data5[[All, {1, 7}]];
      wdotvst5 = data5[[All, {1, 8}]];
```

ListLinePlot[avst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "a vs t for i = 60.5", GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}] ListLinePlot[evst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "e vs t for i = 60.5", GridLines  $\rightarrow$  Automatic , Frame  $\rightarrow$  True , FrameLabel  $\rightarrow$  {"t (sec)", "e"}] ListLinePlot[ivst5, PlotStyle → Blue, PlotLabel → "i vs t for i = 60.5", GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}] ListLinePlot [Wvst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  " $\Omega$  vs t for i = 60.5", GridLines  $\rightarrow$  Automatic, Frame  $\rightarrow$  True, FrameLabel  $\rightarrow$  {"t (sec)", " $\Omega$  (rad)"} ListLinePlot[wvst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  " $\omega$  vs t for i = 60.5", GridLines  $\rightarrow$  Automatic, Frame  $\rightarrow$  True, FrameLabel  $\rightarrow$  {"t (sec)", " $\omega$  (rad)"} ListLinePlot[Wdotvst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "d $\Omega$ /dt vs t for i = 60.5", GridLines  $\rightarrow$  Automatic , Frame  $\rightarrow$  True , FrameLabel  $\rightarrow$  {"t (sec)", "d $\Omega$ /dt (rad/sec)"} ListLinePlot[wdotvst5, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "d $\omega$ /dt vs t for i = 60.5", 





t (sec)

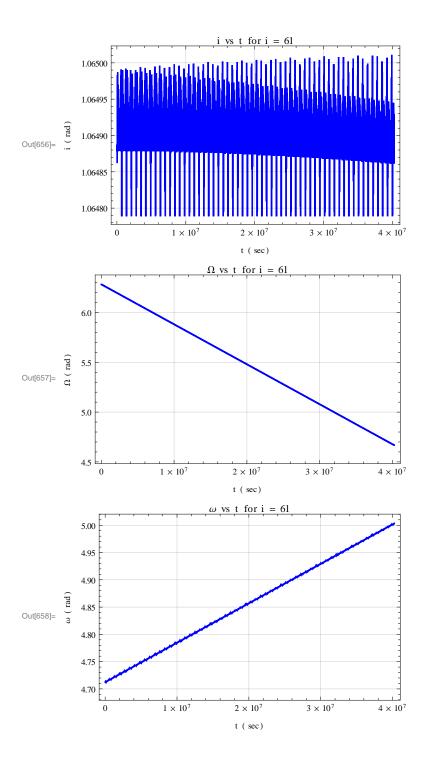


#### = i = 61

```
in[647]:= avst6 = data6[[All, {1, 2}]];
       evst6 = data6[[All, {1, 3}]];
       ivst6 = data6[[All, {1, 4}]];
       Wvst6 = data6[[All, {1, 5}]];
       wvst6 = data6[[All, {1, 6}]];
       Wdotvst6 = data6[[All, {1, 7}]];
       wdotvst6 = data6[[All, {1, 8}]];
       ListLinePlot[avst6, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 61",
        GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
       ListLinePlot [evst6, PlotStyle → Blue, PlotLabel → "e vs t for i = 61",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
       ListLinePlot[ivst6, PlotStyle → Blue, PlotLabel → "i vs t for i = 61",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
       ListLinePlot[Wvst6, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 61",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
       ListLinePlot[wvst6, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 61",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
       ListLinePlot[Wdotvst6, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega\)/dt vs t for i = 61",
         ListLinePlot[wdotvst6, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 61",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
                                    a vs t for i = 61
           25 524
           25 523
        km)
Out[654]=
           25 522
           25 521
                           1 \times 10^7
                                         2 \times 10^7
                                                      3 \times 10^{7}
                                                                   4 \times 10^{7}
                                         t (sec)
       ο 0.75140
Out[655]=
          0.75135
```

 $3 \times 10^{7}$ 

t (sec)

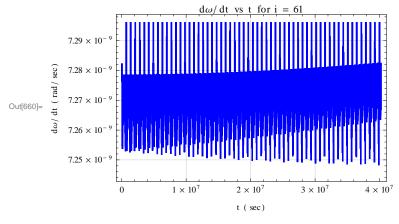


 $1 \times 10^{5}$ 

 $2 \times 10^{\circ}$ 

t (sec)

 $4 \times 10^{\circ}$ 



#### = i = 61.5

 $-4.052 \times 10^{-8}$ 

in[661]:= avst7 = data7[[All, {1, 2}]];
 evst7 = data7[[All, {1, 3}]];
 ivst7 = data7[[All, {1, 4}]];
 Wvst7 = data7[[All, {1, 5}]];
 wvst7 = data7[[All, {1, 6}]];
 Wdotvst7 = data7[[All, {1, 7}]];
 wdotvst7 = data7[[All, {1, 8}]];

ListLinePlot[avst7, PlotStyle → Blue, PlotLabel → "a vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → (sec) ", "a (km)"}]

ListLinePlot[evst7, PlotStyle → Blue, PlotLabel → "e vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → (sec) ", "e"}]

ListLinePlot[ivst7, PlotStyle → Blue, PlotLabel → "i vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "i (rad)")}]

ListLinePlot[Wvst7, PlotStyle → Blue, PlotLabel → "\Omega vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "\Omega (rad)")}]

ListLinePlot[wvst7, PlotStyle → Blue, PlotLabel → "\Omega vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "\Omega (rad)")]

ListLinePlot[Wdotvst7, PlotStyle → Blue, PlotLabel → "d\Omega (rad) vs t for i = 61.5",

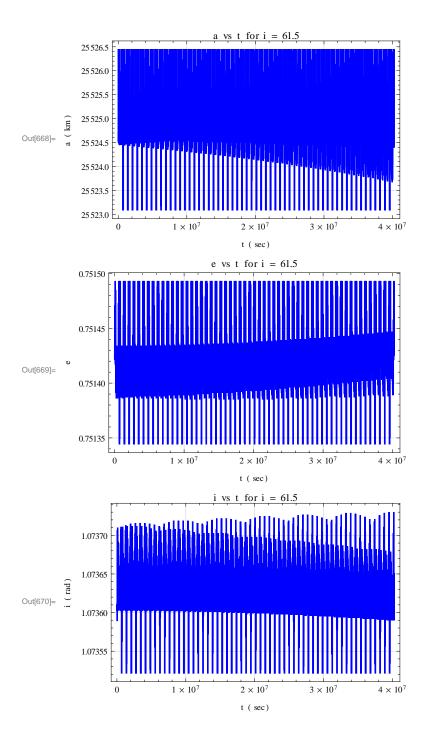
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "d\Omega (rad) sec) ")]

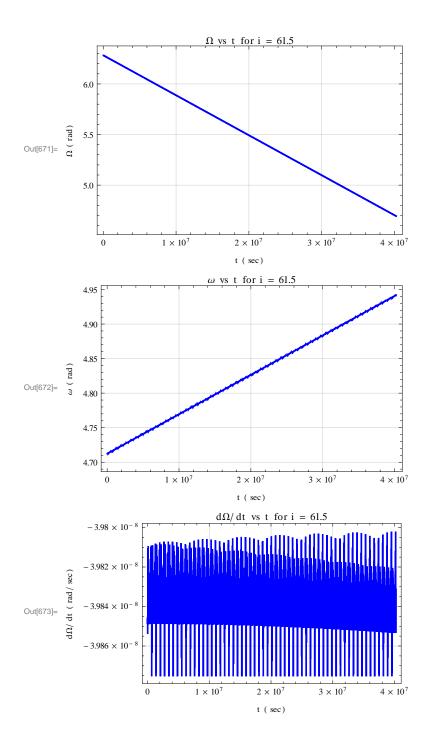
ListLinePlot[wdotvst7, PlotStyle → Blue, PlotLabel → "d\Omega (rad) vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "d\Omega (rad) sec) ")]

ListLinePlot[wdotvst7, PlotStyle → Blue, PlotLabel → "d\Omega (rad) vs t for i = 61.5",

GridLines → Automatic, Frame → True, FrameLabel → ("t (sec) ", "d\Omega (rad) sec) ")]





#### = i = 62

```
in[675]:= avst8 = data8[[All, {1, 2}]];
    evst8 = data8[[All, {1, 3}]];
    ivst8 = data8[[All, {1, 4}]];
    Wvst8 = data8[[All, {1, 5}]];
    wvst8 = data8[[All, {1, 6}]];
    Wdotvst8 = data8[[All, {1, 7}]];
    wdotvst8 = data8[[All, {1, 7}]];
```

ListLinePlot [avst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 62",

GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel -> {"t (sec)", "a (km)"}]

ListLinePlot [evst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "e vs t for i = 62",

GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel -> {"t (sec)", "e"}]

ListLinePlot [ivst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "i vs t for i = 62",

GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel -> {"t (sec)", "i (rad)"}]

ListLinePlot [Wvst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 62",

GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow "\omega vs t for i = 62",

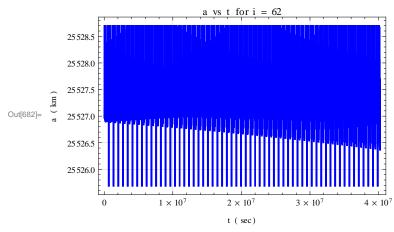
GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow \limits (sec)", "\omega (rad)"}]

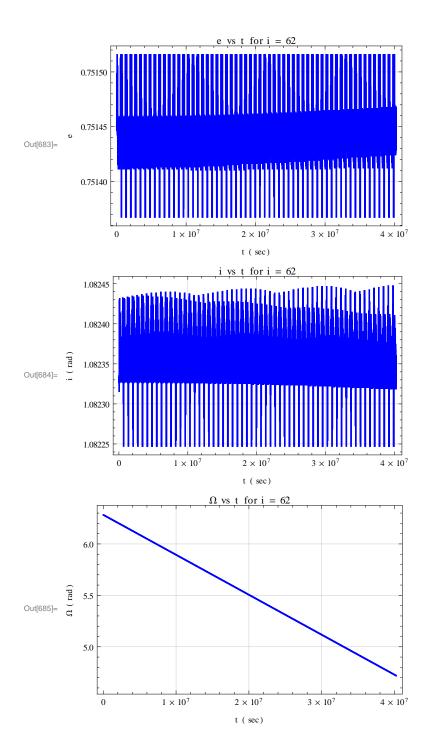
ListLinePlot [Wdotvst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega / dt vs t for i = 62",

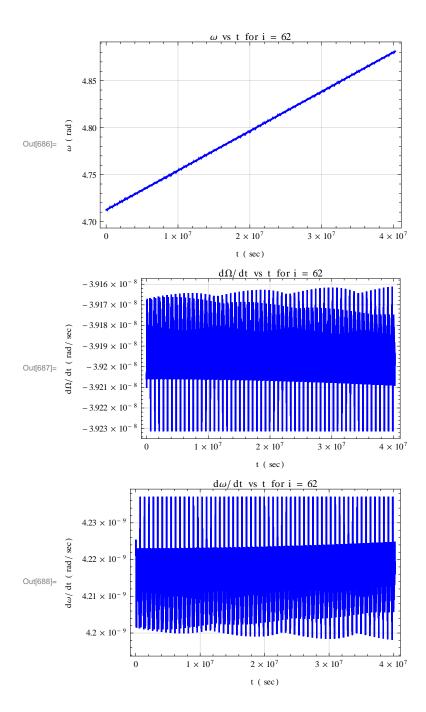
GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow \limits (sec)", "d\Omega / dt (rad/sec)"}]

ListLinePlot [wdotvst8, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega / dt vs t for i = 62",

GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow \limits (sec)", "d\Omega / dt (rad/sec)"}]



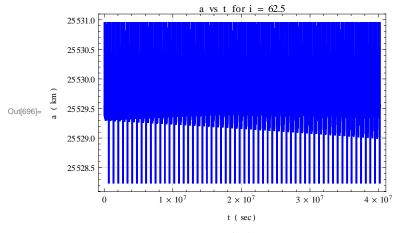


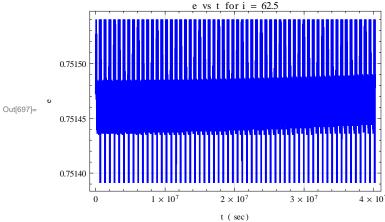


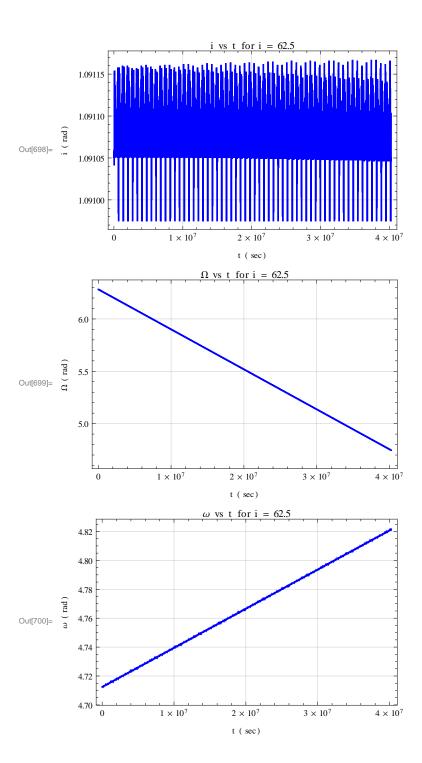
#### = i = 62.5

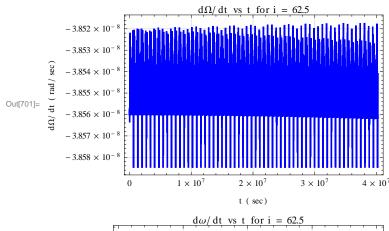
```
in[689]:= avst9 = data9[[All, {1, 2}]];
      evst9 = data9[[All, {1, 3}]];
      ivst9 = data9[[All, {1, 4}]];
      Wvst9 = data9[[All, {1, 5}]];
      wvst9 = data9[[All, {1, 6}]];
      Wdotvst9 = data9[[All, {1, 7}]];
      wdotvst9 = data9[[All, {1, 8}]];
```

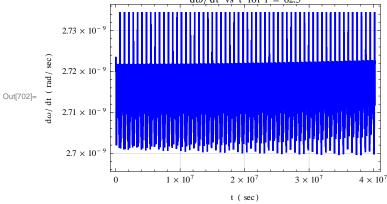
ListLinePlot[avst9, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "a vs t for i = 62.5", GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}] ListLinePlot[evst9, PlotStyle → Blue, PlotLabel → "e vs t for i = 62.5",  $\label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic}\,\,,\,\,\, \texttt{Frame} \rightarrow \texttt{True}\,\,,\,\, \texttt{FrameLabel}\,\, -\!\!\!\!>\, \{\texttt{"t}\,\,\,(\,\texttt{sec}\,)\,\texttt{",}\,\,\texttt{"e}\,\texttt{"}\}]$ ListLinePlot[ivst9, PlotStyle → Blue, PlotLabel → "i vs t for i = 62.5", GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}] ListLinePlot[Wvst9, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  " $\Omega$  vs t for i = 62.5", GridLines  $\rightarrow$  Automatic, Frame  $\rightarrow$  True, FrameLabel  $\rightarrow$  {"t (sec)", " $\Omega$  (rad)"} ListLinePlot[wvst9, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  " $\omega$  vs t for i = 62.5", GridLines  $\rightarrow$  Automatic, Frame  $\rightarrow$  True, FrameLabel  $\rightarrow$  {"t (sec)", " $\omega$  (rad)"} ListLinePlot[Wdotvst9, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "d $\Omega$ /dt vs t for i = 62.5", ListLinePlot[wdotvst9, PlotStyle  $\rightarrow$  Blue, PlotLabel  $\rightarrow$  "d $\omega$ /dt vs t for i = 62.5", GridLines  $\rightarrow$  Automatic, Frame  $\rightarrow$  True, FrameLabel  $\rightarrow$  {"t (sec)", "d $\omega$ /dt (rad/sec)"}







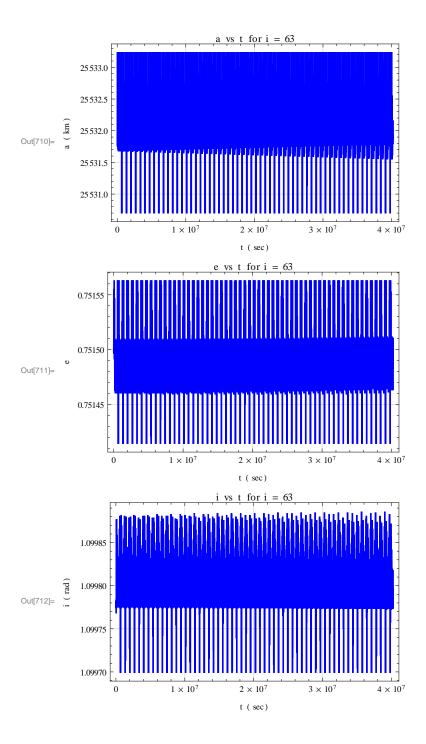


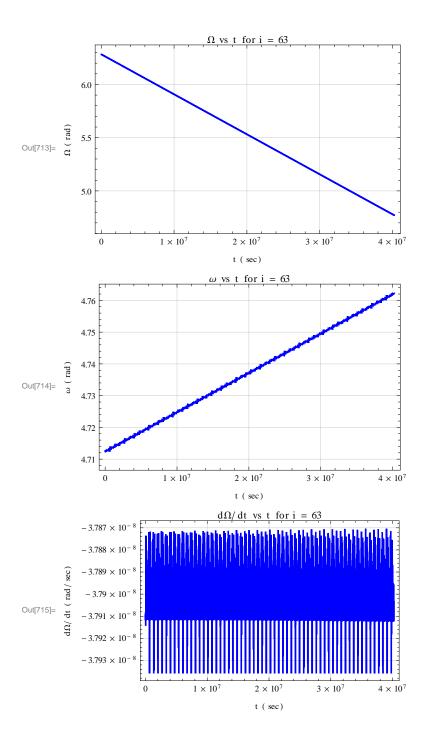


#### = i = 63

```
In[703]:= avst10 = data10[[All, {1, 2}]];
      evst10 = data10[[All, {1, 3}]];
      ivst10 = data10[[All, {1, 4}]];
      Wvst10 = data10[[All, {1, 5}]];
      wvst10 = data10[[All, {1, 6}]];
      Wdotvst10 = data10[[All, {1, 7}]];
      wdotvst10 = data10[[All, {1, 8}]];
```

```
ListLinePlot[avst10, PlotStyle → Blue, PlotLabel → "a vs t for i = 63",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
ListLinePlot[evst10, PlotStyle → Blue, PlotLabel → "e vs t for i = 63",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
ListLinePlot[ivst10, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "i vs t for i = 63",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
ListLinePlot [Wvst10, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 63",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
ListLinePlot[wvst10, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 63",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
ListLinePlot [Wdotvst10, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega/dt vs t for i = 63",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "dQ/dt (rad/sec)"}
ListLinePlot[wdotvst10, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 63",
```

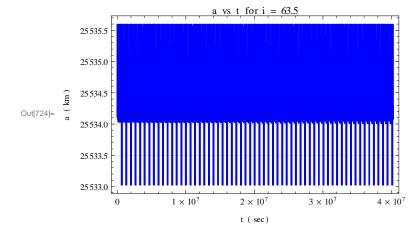


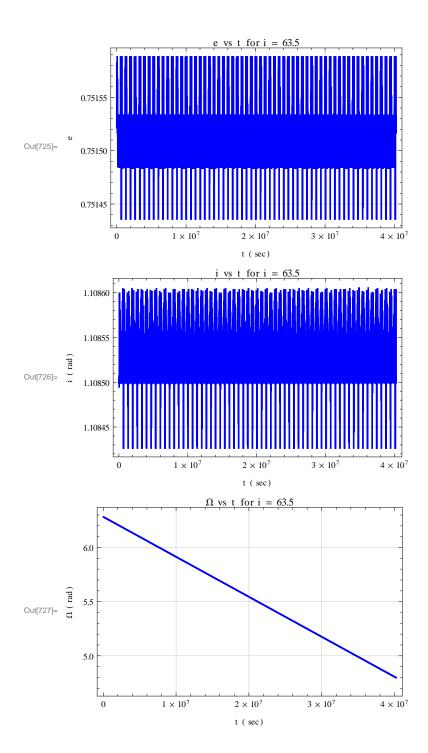


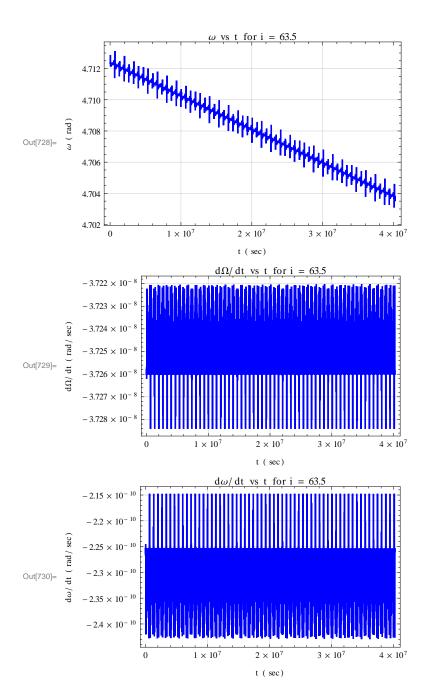
## = i = 63.5

```
In[717]:= avst11 = data11[[All, {1, 2}]];
    evst11 = data11[[All, {1, 3}]];
    ivst11 = data11[[All, {1, 4}]];
    Wvst11 = data11[[All, {1, 5}]];
    wvst11 = data11[[All, {1, 6}]];
    Wdotvst11 = data11[[All, {1, 7}]];
    wdotvst11 = data11[[All, {1, 8}]];
```

ListLinePlot[avst11, PlotStyle → Blue, PlotLabel → "a vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "a (km)")]
ListLinePlot[evst11, PlotStyle → Blue, PlotLabel → "e vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "e")]
ListLinePlot[ivst11, PlotStyle → Blue, PlotLabel → "i vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "i (rad)")]
ListLinePlot[Wvst11, PlotStyle → Blue, PlotLabel → "Ω vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "Ω (rad)")]
ListLinePlot[wvst11, PlotStyle → Blue, PlotLabel → "ω vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "ω (rad)")]
ListLinePlot[Wdotvst11, PlotStyle → Blue, PlotLabel → "dΩ/dt vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "dΩ/dt (rad/sec)")]
ListLinePlot[wdotvst11, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "dΩ/dt (rad/sec)")]
ListLinePlot[wdotvst11, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 63.5",
GridLines → Automatic, Frame → True, FrameLabel → ("t (sec)", "dω/dt (rad/sec)")]







```
= i = 64
```

0.75145

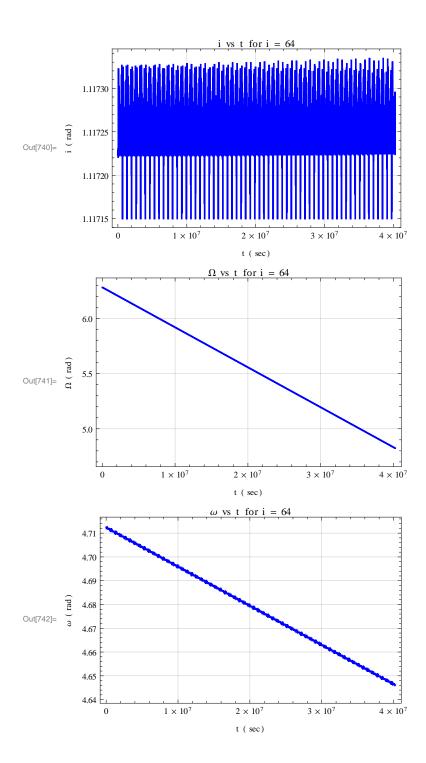
```
in[731]:= avst12 = data12[[All, {1, 2}]];
        evst12 = data12[[All, {1, 3}]];
        ivst12 = data12[[All, {1, 4}]];
        Wvst12 = data12[[All, {1, 5}]];
        wvst12 = data12[[All, {1, 6}]];
        Wdotvst12 = data12[[All, {1, 7}]];
        wdotvst12 = data12[[All, {1, 8}]];
        ListLinePlot[avst12, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 64",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
        ListLinePlot[evst12, PlotStyle → Blue, PlotLabel → "e vs t for i = 64",
          \label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic}\,\,,\,\,\, \texttt{Frame} \rightarrow \texttt{True}\,\,,\,\, \texttt{FrameLabel}\,\, -\!\!\!\!>\, \{\texttt{"t}\,\,\,(\,\texttt{sec}\,)\,\texttt{",}\,\,\texttt{"e}\,\texttt{"}\}]
        ListLinePlot[ivst12, PlotStyle → Blue, PlotLabel → "i vs t for i = 64",
          GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
        ListLinePlot [Wvst12, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 64",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
        ListLinePlot[wvst12, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 64",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
        ListLinePlot [Wdotvst12, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega/dt vs t for i = 64",
          ListLinePlot[wdotvst12, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 64",
          GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
            25 537.5
            25 537.0
         km)
Out[738]=
            25 536.5
            25 536.0
            25 535.5
                               1 \times 10^{7}
                                              2 \times 10^{7}
                                                            3 \times 10^{7}
                                                                           4 \times 10^{7}
                                              t (sec)
                                         e vs t for i = 64
            0.75155
Out[739]=
```

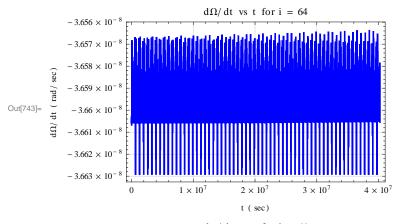
 $2 \times 10^{7}$ 

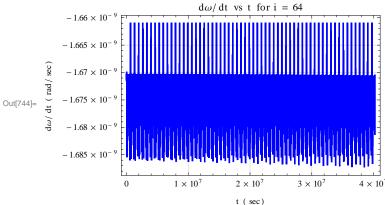
t (sec)

 $3 \times 10^{7}$ 

 $4 \times 10^{\circ}$ 



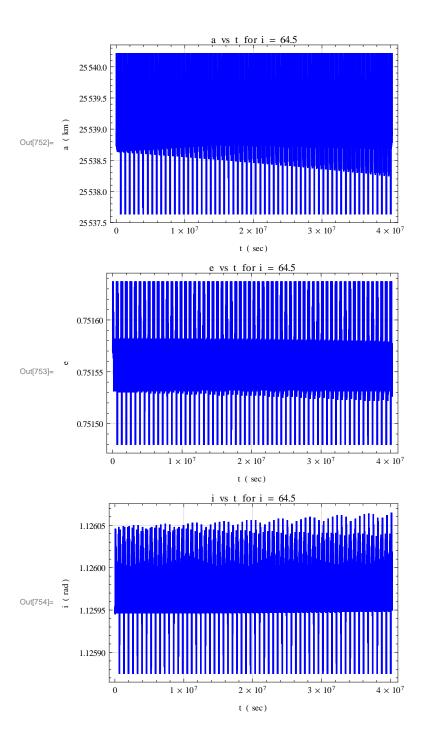


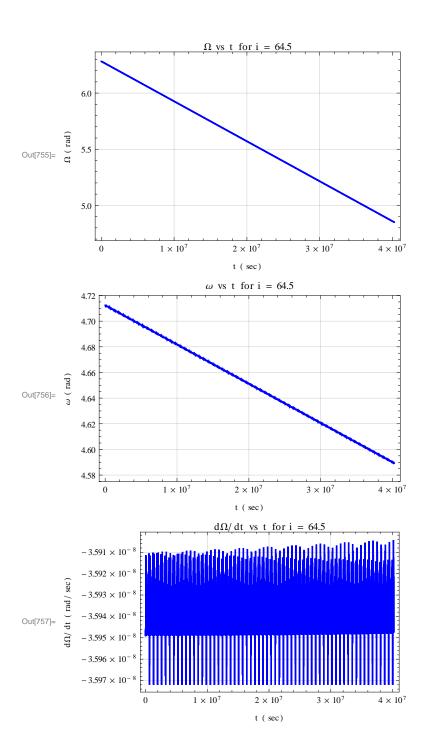


#### = i = 64.5

```
In[745]:= avst13 = data13[[All, {1, 2}]];
      evst13 = data13[[All, {1, 3}]];
      ivst13 = data13[[All, {1, 4}]];
      Wvst13 = data13[[All, {1, 5}]];
      wvst13 = data13[[All, {1, 6}]];
      Wdotvst13 = data13[[All, {1, 7}]];
      wdotvst13 = data13[[All, {1, 8}]];
```

```
ListLinePlot[avst13, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 64.5",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
ListLinePlot[evst13, PlotStyle → Blue, PlotLabel → "e vs t for i = 64.5",
 \label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic}\,,\;\; \texttt{Frame} \rightarrow \texttt{True}\,,\; \texttt{FrameLabel} \rightarrow \{\texttt{"t}\;\; (\texttt{sec})\texttt{"}, \texttt{"e}\texttt{"}\}]
ListLinePlot[ivst13, PlotStyle → Blue, PlotLabel → "i vs t for i = 64.5",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
ListLinePlot [Wvst13, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 64.5",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
ListLinePlot[wvst13, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 64.5",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
ListLinePlot [Wdotvst13, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega\)/dt vs t for i = 64.5",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\Omega/dt (rad/sec)"}
ListLinePlot[wdotvst13, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 64.5",
```





#### ■ i = 65

```
in[759]:= avst14 = data14[[All, {1, 2}]];
  evst14 = data14[[All, {1, 3}]];
  ivst14 = data14[[All, {1, 4}]];
  Wvst14 = data14[[All, {1, 5}]];
  wvst14 = data14[[All, {1, 6}]];
  Wdotvst14 = data14[[All, {1, 7}]];
  wdotvst14 = data14[[All, {1, 7}]];
```

ListLinePlot[avst14, PlotStyle → Blue, PlotLabel → "a vs t for i = 65",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]

ListLinePlot[evst14, PlotStyle → Blue, PlotLabel → "e vs t for i = 65",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]

ListLinePlot[ivst14, PlotStyle → Blue, PlotLabel → "i vs t for i = 65",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]

ListLinePlot[Wvst14, PlotStyle → Blue, PlotLabel → "Ω vs t for i = 65",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "Ω (rad)"}]

ListLinePlot[wvst14, PlotStyle → Blue, PlotLabel → "ω vs t for i = 65",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "ω (rad)"}]

ListLinePlot[Wdotvst14, PlotStyle → Blue, PlotLabel → "dΩ/dt vs t for i = 65",

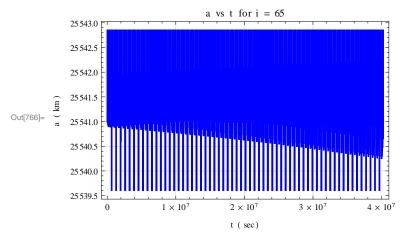
GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dΩ/dt (rad/sec)"}]

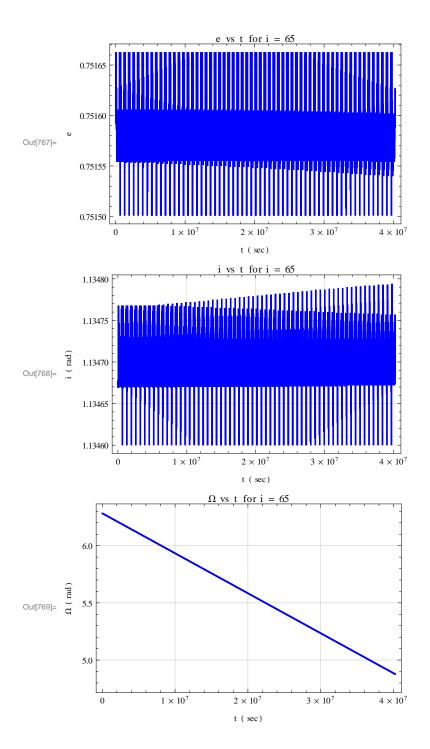
ListLinePlot[wdotvst14, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 65",

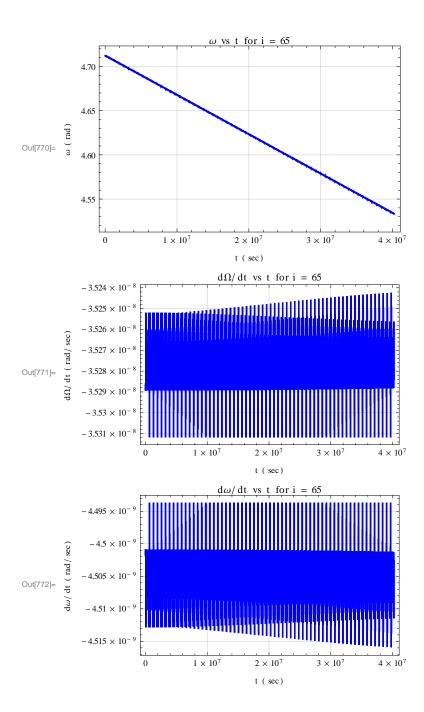
GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dΩ/dt (rad/sec)"}]

ListLinePlot[wdotvst14, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 65",

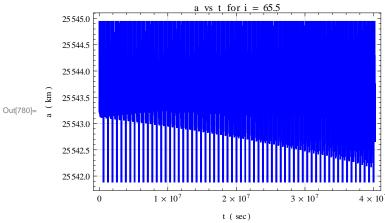
GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dω/dt (rad/sec)"}]

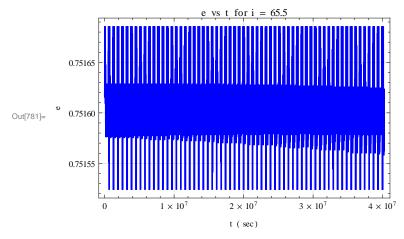


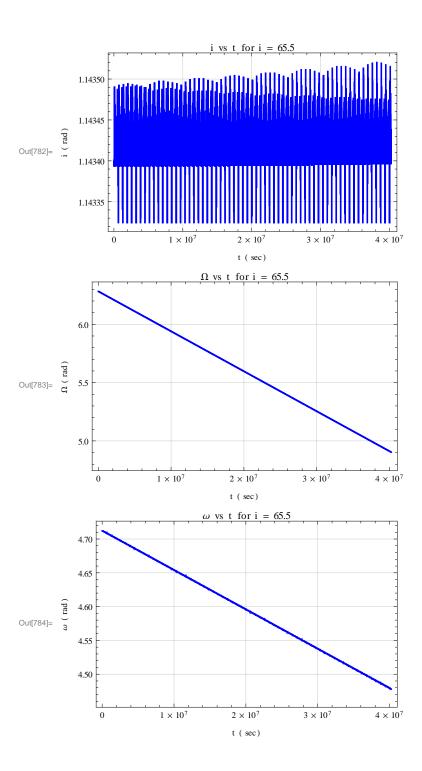


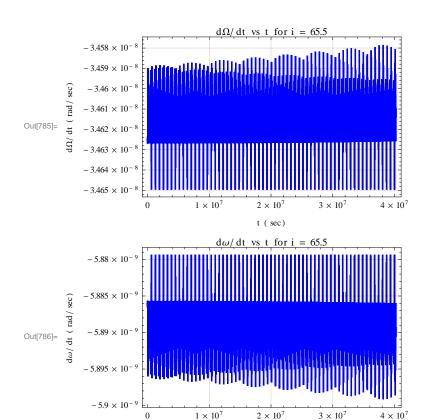


```
= i = 65.5
In[773]:= avst15 = data15[[All, {1, 2}]];
       evst15 = data15[[All, {1, 3}]];
       ivst15 = data15[[All, {1, 4}]];
       Wvst15 = data15[[All, {1, 5}]];
       wvst15 = data15[[All, {1, 6}]];
       Wdotvst15 = data15[[All, {1, 7}]];
       wdotvst15 = data15[[All, {1, 8}]];
       ListLinePlot[avst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 65.5",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
       ListLinePlot[evst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "e vs t for i = 65.5",
         \label{eq:condition} \texttt{GridLines} \rightarrow \texttt{Automatic}\,\,,\,\,\, \texttt{Frame} \rightarrow \texttt{True}\,\,,\,\, \texttt{FrameLabel}\,\, -\!\!\!\!>\, \{\texttt{"t}\,\,\,(\,\texttt{sec}\,)\,\texttt{",}\,\,\texttt{"e}\,\texttt{"}\}]
       ListLinePlot[ivst15, PlotStyle → Blue, PlotLabel → "i vs t for i = 65.5",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
       ListLinePlot [Wvst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 65.5",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
       ListLinePlot[wvst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 65.5",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
       ListLinePlot[Wdotvst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega/\)dt vs t for i = 65.5",
         ListLinePlot[wdotvst15, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 65.5",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
```







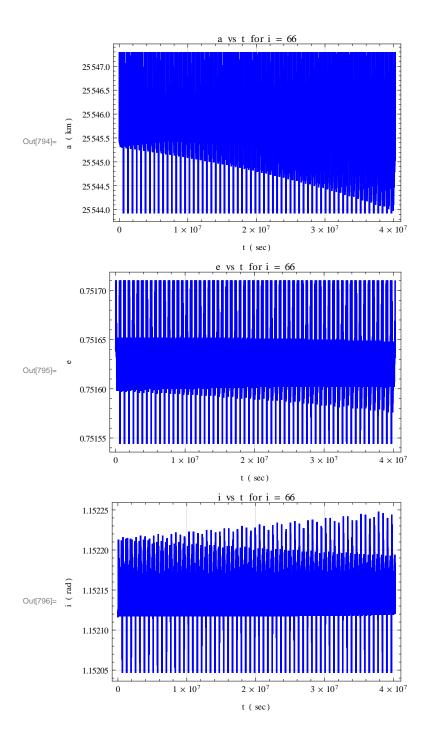


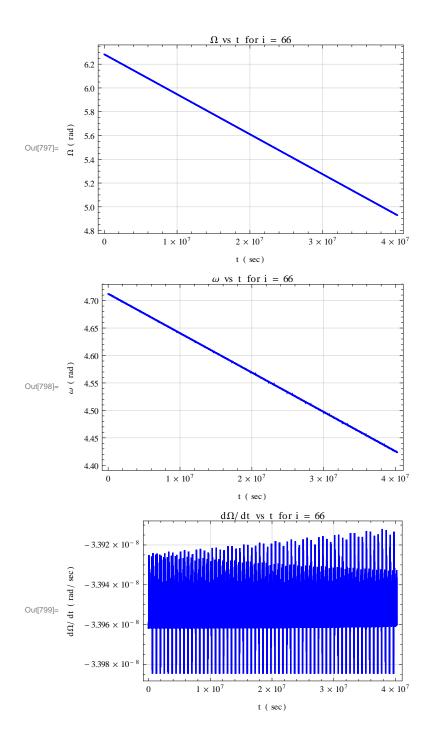
# = i = 66

```
In[787]:= avst16 = data16[[All, {1, 2}]];
      evst16 = data16[[All, {1, 3}]];
      ivst16 = data16[[All, {1, 4}]];
      Wvst16 = data16[[All, {1, 5}]];
      wvst16 = data16[[All, {1, 6}]];
      Wdotvst16 = data16[[All, {1, 7}]];
      wdotvst16 = data16[[All, {1, 8}]];
```

t (sec)

```
ListLinePlot[avst16, PlotStyle → Blue, PlotLabel → "a vs t for i = 66",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
ListLinePlot[evst16, PlotStyle → Blue, PlotLabel → "e vs t for i = 66",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
ListLinePlot[ivst16, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "i vs t for i = 66",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
ListLinePlot [Wvst16, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 66",
 GridLines \rightarrow Automatic , Frame \rightarrow True , FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
ListLinePlot[wvst16, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 66",
 \texttt{GridLines} \rightarrow \texttt{Automatic} \; , \; \; \texttt{Frame} \rightarrow \texttt{True} \; , \; \; \texttt{FrameLabel} \; -> \; \{\texttt{"t} \; \; (\texttt{sec})\texttt{"}, \; \texttt{"}\omega \; \; (\texttt{rad})\texttt{"}\}]
ListLinePlot[Wdotvst16, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega\)/ dt vs t for i = 66",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "dQ/dt (rad/sec)"}]
ListLinePlot[wdotvst16, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 66",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
```





### = i = 66.5

in[801]:= avst17 = data17[[All, {1, 2}]];
 evst17 = data17[[All, {1, 3}]];
 ivst17 = data17[[All, {1, 4}]];
 Wvst17 = data17[[All, {1, 5}]];
 wvst17 = data17[[All, {1, 6}]];
 Wdotvst17 = data17[[All, {1, 7}]];
 wdotvst17 = data17[[All, {1, 8}]];

ListLinePlot[avst17, PlotStyle → Blue, PlotLabel → "a vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]

ListLinePlot[evst17, PlotStyle → Blue, PlotLabel → "e vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]

ListLinePlot[ivst17, PlotStyle → Blue, PlotLabel → "i vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]

ListLinePlot[Wvst17, PlotStyle → Blue, PlotLabel → "Ω vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "Ω (rad)"}]

ListLinePlot[wvst17, PlotStyle → Blue, PlotLabel → "ω vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "ω (rad)"}]

ListLinePlot[Wdotvst17, PlotStyle → Blue, PlotLabel → "dΩ/dt vs t for i = 66.5",

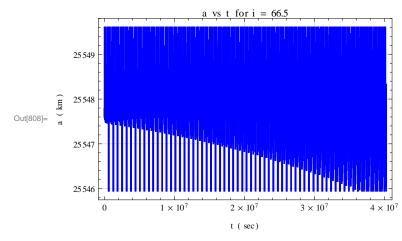
GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dΩ/dt (rad/sec)"}]

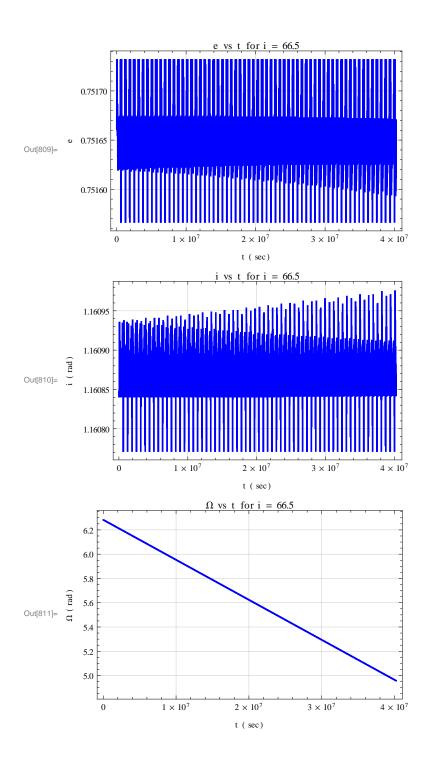
ListLinePlot[wdotvst17, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 66.5",

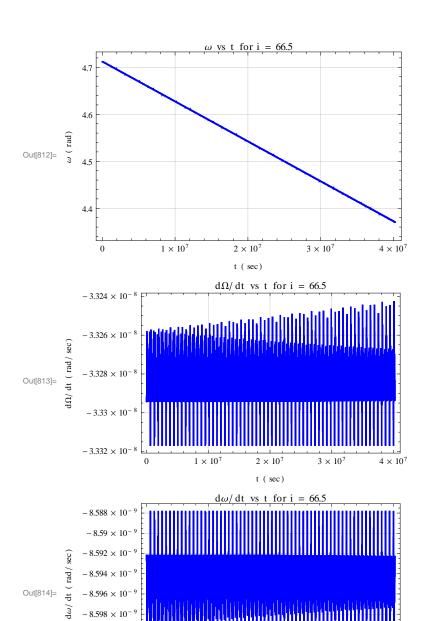
GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dΩ/dt (rad/sec)"}]

ListLinePlot[wdotvst17, PlotStyle → Blue, PlotLabel → "dω/dt vs t for i = 66.5",

GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "dω/dt (rad/sec)"}]







 $1 \times 10^{7}$ 

 $2 \times 10^7$ 

t (sec)

 $3 \times 10^7$ 

 $4 \times 10^7$ 

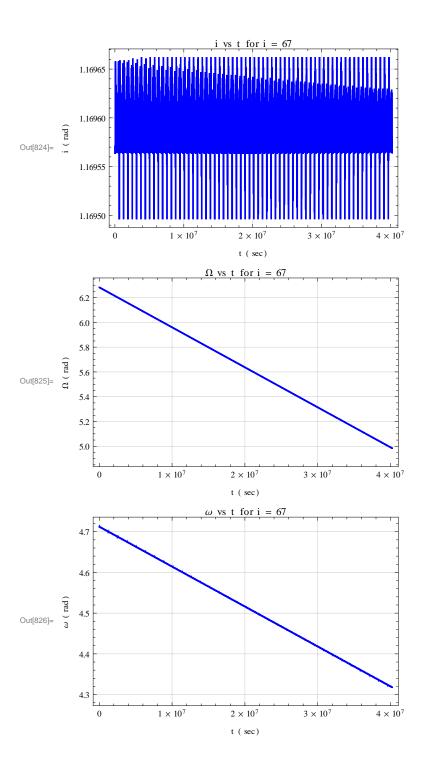
 $-8.598 \times 10^{-9}$  $-8.6 \times 10^{-9}$  $-8.602 \times 10^{-9}$ 

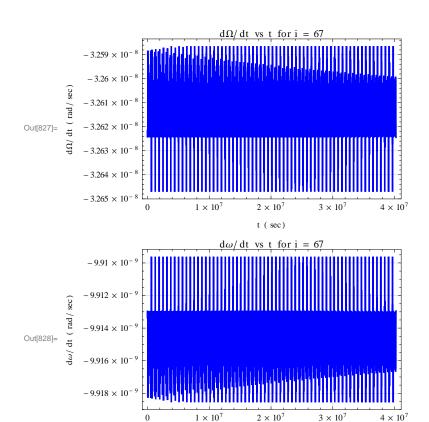
0

```
= i = 67
```

```
In[815]:= avst18 = data18[[All, {1, 2}]];
        evst18 = data18[[All, {1, 3}]];
        ivst18 = data18[[All, {1, 4}]];
       Wvst18 = data18[[All, {1, 5}]];
        wvst18 = data18[[All, {1, 6}]];
        Wdotvst18 = data18[[All, {1, 7}]];
        wdotvst18 = data18[[All, {1, 8}]];
        ListLinePlot[avst18, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "a vs t for i = 67",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
        ListLinePlot[evst18, PlotStyle → Blue, PlotLabel → "e vs t for i = 67",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
        ListLinePlot[ivst18, PlotStyle → Blue, PlotLabel → "i vs t for i = 67",
         GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
        ListLinePlot [Wvst18, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 67",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
        ListLinePlot[wvst18, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 67",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "\omega (rad)"}
        ListLinePlot [Wdotvst18, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\Omega/dt vs t for i = 67",
         ListLinePlot[wdotvst18, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 67",
         GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
           25 552
           25 551
       a (km)
           25 550
Out[822]=
           25 549
           25\,548
                            1 \times 10^{7}
                                         2 \times 10^{7}
                                                      3 \times 10^{7}
                                                                    4 \times 10^{7}
                                         t (sec)
          0.75175
          0.75170
Out[823]=
          0.75165
           0.75160
                                                       3 \times 10^{7}
```

t (sec)



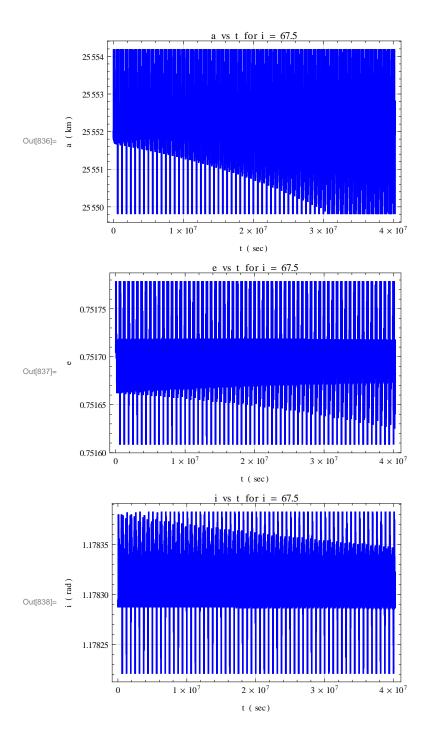


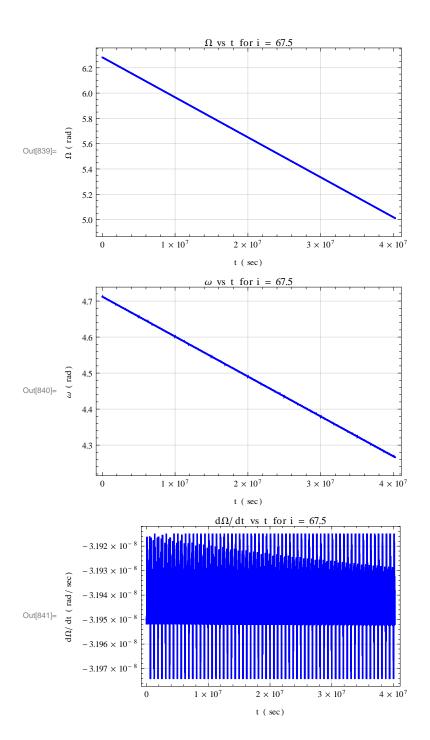
# = i = 67.5

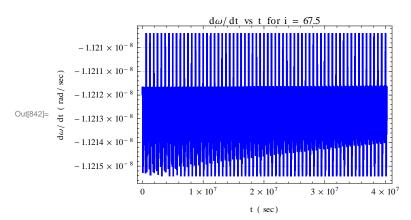
```
In[829]:= avst19 = data19[[All, {1, 2}]];
      evst19 = data19[[All, {1, 3}]];
      ivst19 = data19[[All, {1, 4}]];
      Wvst19 = data19[[All, {1, 5}]];
      wvst19 = data19[[All, {1, 6}]];
      Wdotvst19 = data19[[All, {1, 7}]];
      wdotvst19 = data19[[All, {1, 8}]];
```

t (sec)

```
ListLinePlot[avst19, PlotStyle → Blue, PlotLabel → "a vs t for i = 67.5",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "a (km)"}]
ListLinePlot[evst19, PlotStyle → Blue, PlotLabel → "e vs t for i = 67.5",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "e"}]
ListLinePlot[ivst19, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "i vs t for i = 67.5",
 GridLines → Automatic, Frame → True, FrameLabel -> {"t (sec)", "i (rad)"}]
ListLinePlot [Wvst19, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\Omega vs t for i = 67.5",
 GridLines \rightarrow Automatic , Frame \rightarrow True , FrameLabel \rightarrow {"t (sec)", "\Omega (rad)"}
ListLinePlot [wvst19, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "\omega vs t for i = 67.5",
 \texttt{GridLines} \rightarrow \texttt{Automatic}\,\,,\,\,\, \texttt{Frame} \rightarrow \texttt{True}\,\,,\,\, \texttt{FrameLabel} \rightarrow \{\texttt{"t} \,\,\,(\texttt{sec})\,\texttt{"},\,\,\texttt{"}\omega \,\,\,(\texttt{rad})\,\texttt{"}\}]
ListLinePlot [Wdotvst19, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\(\Omega\)/dt vs t for i = 67.5",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "dQ/dt (rad/sec)"}]
ListLinePlot[wdotvst19, PlotStyle \rightarrow Blue, PlotLabel \rightarrow "d\omega/dt vs t for i = 67.5",
 GridLines \rightarrow Automatic, Frame \rightarrow True, FrameLabel \rightarrow {"t (sec)", "d\omega/dt (rad/sec)"}
```







# Σχόλια και παρατηρήσεις

Παρατηρούμε πως τα αποτελέσματα συμφωνούν με την θεωρία. Πιο συγκεκριμένα, φαίνεται πως για  $0 \le i < 63.4 \Longrightarrow d\omega/dt > 0$ , en Wight  $63.4 < i \le 116.6 \Longrightarrow d\omega/dt < 0$ .

 $\Gamma$ ια  $\mathbf{i} = 63.4$  (πρώτη κρίσιμη τιμή) η γραμμή των αψίδων παραμένει σταθερή.

 $Επίσης, ισχ ύει συν ξχεια πως <math>0 ≤ i < 90 \Longrightarrow dΩ/dt < 0$ .

Τέλος,  $\varphi \alpha$ ίνεται πως τα αποτελέσματ  $\dot{\alpha}$ μας, συμφωνο $\dot{\omega}$ ν και με την  $\theta$ εωρ $\dot{\alpha}$  averaged.