In [90]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [91]:

```
cart = [pd.read_csv("Dades_takes/"+str(i)+"Cart.csv") for i in range(1,5)] #Llegeixo fitxers
```

In [92]:

```
pol = [pd.read_csv("Dades_takes/"+str(i)+"Pol.csv") for i in range(1,5)]
pol = [p.drop('Unnamed: 0', 1) for p in pol] #Una guarrada, trec a mà una columna que em sobra
```

Hem de trobar: Període, perihelion precession, excentricitat i semieix major

In [93]:

```
#Trobem els màxims, per cada take
p = pol[0]
```

In [94]:

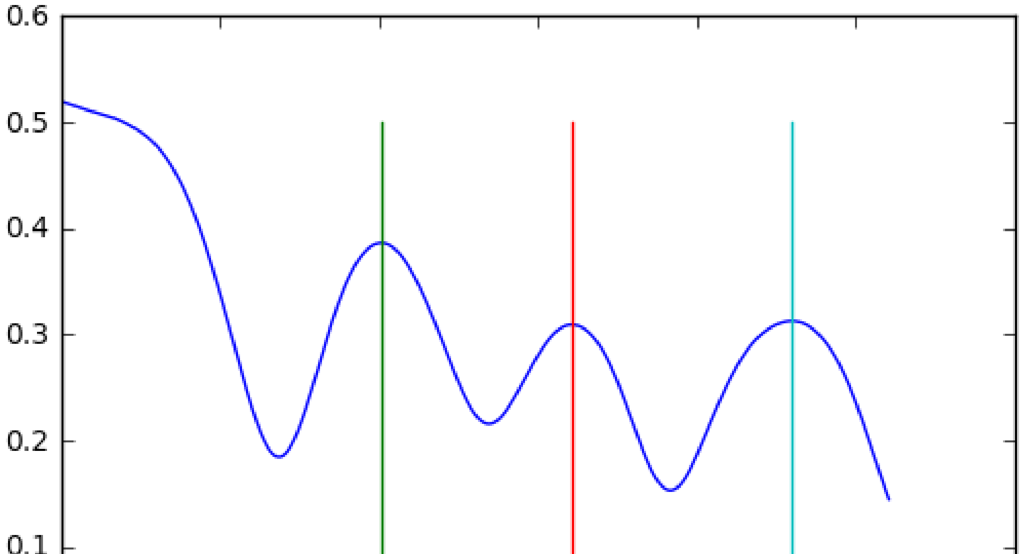
```
z = p.loc[abs(p['r-dot']) < 0.0027] #Aquestes precisions són amb prova i error
z = z.loc[p['r-dotdot'] < 0] #obvi, no?
z
```

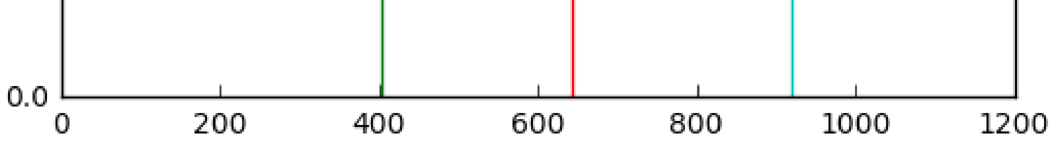
Out[94]:

	t	phi	omega	alpha	r	r-dot	r-dotdot
403	2.238889	5.061959	1.281938	-0.019233	0.386377	0.001929	-1.251190
643	3.572222	8.441927	1.815490	0.008452	0.309412	0.001614	-1.077273
920	5.111111	13.061033	1.653063	0.004167	0.312830	-0.000612	-0.619983

In [95]:

```
%matplotlib inline
plt.plot(p['r'])
for i in z.index.tolist():
    plt.plot((i,i), (0, 0.5)) #Sempre va bé veure un gràfic :)
```





In [96]:

```
maxims_1 = z
```

In [97]:

```
p = pol[1]
```

In [98]:

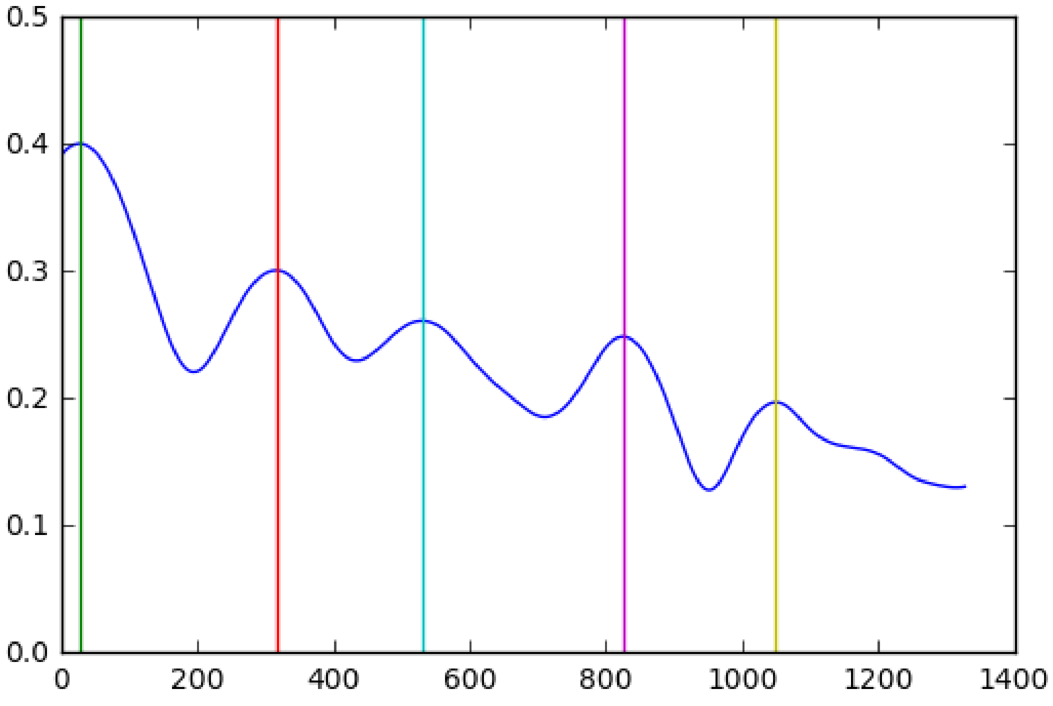
```
z = p.loc[abs(p['r-dot']) < 0.0027]
z = z.loc[p['r-dotdot'] < 0]
z = z.drop(z.index[[3]]) #A vegades he tret els duplicates a mà
z
```

Out[98]:

	t	phi	omega	alpha	r	r-dot	r-dotdot
28	0.155556	0.257012	1.606302	-0.717342	0.400574	-0.001657	-0.836277
316	1.755556	4.221656	2.081260	0.506534	0.300785	0.000105	-0.631635
530	2.944444	7.658388	2.284474	-0.953660	0.261323	0.001013	-0.455887
825	4.583333	12.715063	2.255815	-1.373537	0.248730	0.001847	-0.894878
1049	5.827778	17.081513	2.856227	1.271863	0.197211	0.001673	-0.789028

In [99]:

```
%matplotlib inline
plt.plot(p['r'])
for i in z.index.tolist():
    plt.plot((i,i), (0, 0.5))
```



In [100]:

```
maxims_2 = z
```

```
maxims_2 = z
```

In [101]:

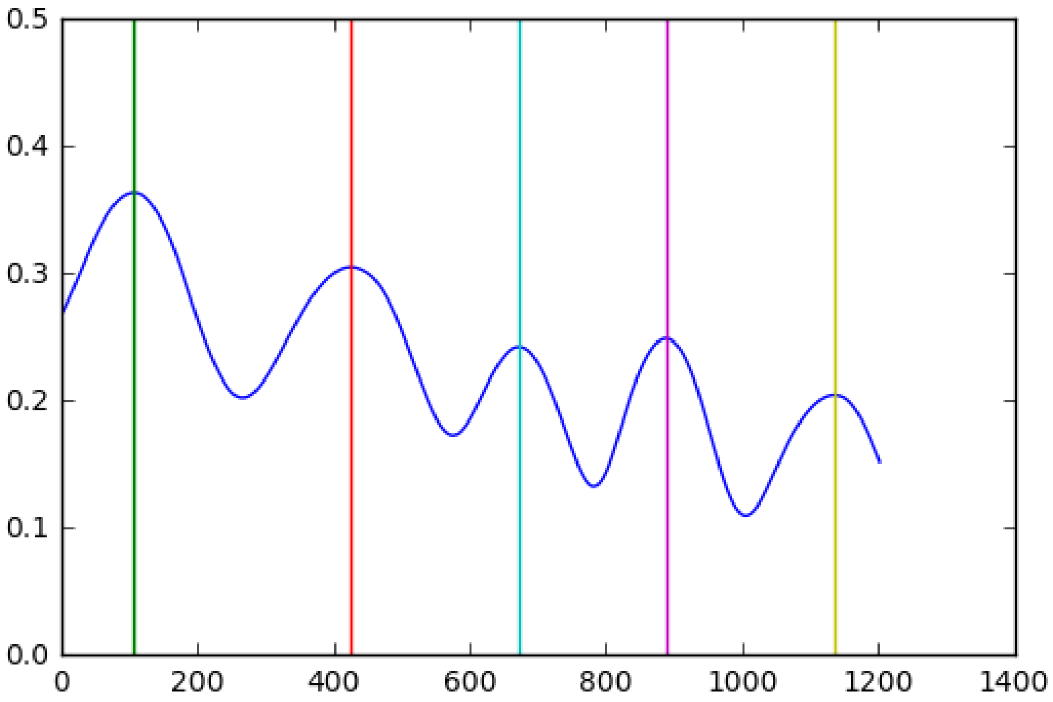
```
p = pol[2]
z = p.loc[abs(p['r-dot']) < 0.0027]
z = z.loc[p['r-dotdot'] < 0]
z = z.drop(z.index[[1,-2]])
z
```

Out[101]:

	t	phi	omega	alpha	r	r-dot	r-dotdot
107	0.594444	1.297958	1.678572	-0.746134	0.363604	0.000282	-0.802746
426	2.366667	5.925370	2.005699	-0.401490	0.305283	-0.000409	-0.502898
673	3.738889	9.958287	1.795531	-0.180724	0.242513	-0.002499	-1.068311
888	4.933333	13.842392	1.806601	-1.044155	0.249192	0.001887	-1.221248
1136	6.311111	18.739458	2.436638	-0.860047	0.204701	-0.001581	-0.686295

In [102]:

```
%matplotlib inline
plt.plot(p['r'])
for i in z.index.tolist():
    plt.plot((i,i), (0, 0.5))
```



In [103]:

```
maxims_3 = z
```

In [104]:

```
p = pol[3]
z = p.loc[abs(p['r-dot']) < 0.003]
z = z.loc[p['r-dotdot'] < 0]
z
```

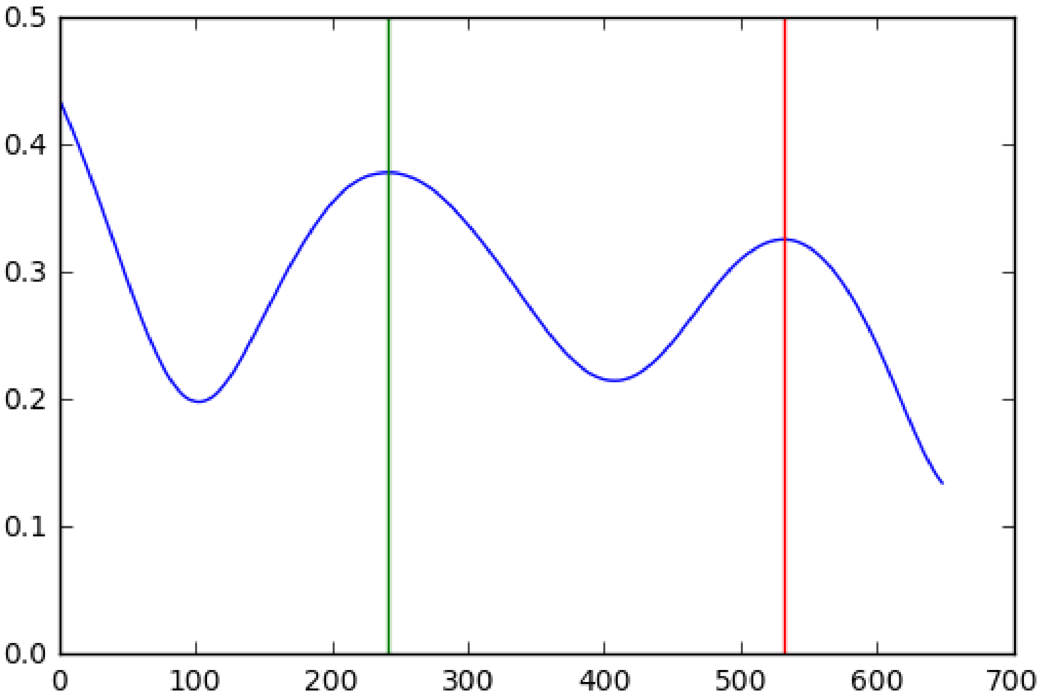
Out[104]:

	t	phi	omega	alpha	r	r-dot	r-dotdot

	t	phi	omega	alpha	r	r-dot	r-dotdot
241	1.338889	3.683203	1.679956	0.758169	0.378450	-0.000049	-0.850489
532	2.955556	7.960408	1.517275	-0.883836	0.325926	-0.002871	-1.141231

In [105]:

```
%matplotlib inline
plt.plot(p['r'])
for i in z.index.tolist():
    plt.plot((i,i), (0, 0.5))
```



In [106]:

```
maxims_4 = z
```

In [107]:

```
maxims = [maxims_1, maxims_2, maxims_3, maxims_4]
```

In [108]:

```
#Període
```

In [109]:

```
i = 0
for dataset in maxims:
    i+=1
    v = dataset.index.tolist() #en aquest vector només hi ha els màxims (les seves posicions, de fet)
    for index in range(len(v)-1):
        print(i, float(dataset.iloc[[index+1]]['t']) - float(dataset.iloc[[index]]['t'])) #crec que prou obvi, suda del float
```

```
1 1.3333333329999997
1 1.5388888890000008
2 1.5999999999999943
2 1.18888888888889
2 1.6388888888888795
2 1.24444444444444
3 1.77222222222217
3 1.37222222222222
3 1.1944444444444402
3 1.37777777777777702
```

```
4 1.61666666666666
```

In [110]:

```
#Perihelion Precession
```

In [111]:

```
i = 0
for dataset in maxims:
    i+=1
    v = dataset.index.tolist()
    for index in range(len(v)-1): #en aquest vector només hi ha els màxims
        print(i, float(dataset.iloc[[index+1]]['phi']) - float(dataset.iloc[[index]]['phi']) - 2*np.pi) #ídem, però estàs segur del 2pi? surten coses rares
```

```
1 -2.9032169245858457
1 -1.6640795550695682
2 -2.3185411933930022
2 -2.8464536128942353
2 -1.2265097564268768
2 -1.9167360885572862
3 -1.6557735566743963
3 -2.2502680608697654
3 -2.3990810975874783
3 -1.3861191630590852
4 -2.0059799799955655
```

In [112]:

```
#Semieix major
```

In [114]:

```
i = 0
l = [] #m'ho guardaré tot en un vector, que els necessito per despres l'eccentricitat
for dataset in maxims:
    i+=1
    v = dataset.index.tolist()
    for index in range(len(v)-1):
        print(i, (float(dataset.iloc[[index+1]]['r']) + float(dataset.iloc[[index]]['r']))/2)
        l.append((float(dataset.iloc[[index+1]]['r']) + float(dataset.iloc[[index]]['r']))/2)
```

```
1 0.347894693513415
1 0.31112112539639253
2 0.3506796802872085
2 0.281054332025614
2 0.255026405797552
2 0.22297009467388001
3 0.33444365529036946
3 0.273898072417711
3 0.245852281370607
3 0.2269463589800905
4 0.35218807358550297
```

In [115]:

```
#Excentricitat
```

In [116]:

```
i = 0
aux = []
for dataset in maxims:
    i+=1
    v = dataset.index.tolist()
    for index in range(len(v)-1):
        aux.append((i, (v[index]+v[index+1])*0.5))
```

In [117]:

```
aux
```

Out[117]:

```
[(1, 523.0),
 (1, 781.5),
 (2, 172.0),
 (2, 423.0),
 (2, 677.5),
 (2, 937.0),
 (3, 266.5),
 (3, 549.5),
 (3, 780.5),
 (3, 1012.0),
 (4, 386.5)]
```

Aquí faig mitja triquinyuela de dir bueno, (ta+tb)/2 no te pq ser un punt de datasets, em sumo els indexs i parteixo per dos, i si es imparell, fare la mitjana dels dos del costat

In [118]:

```
def enter(a):
    return int(a) == int(a+0.6) #una guarrada, torna true si és .0, false si 0.5
```

In [119]:

```
radis = []  #també mels guardo en un vector
for parella in aux:
    dataset = pol[parella[0]-1] #simplement marcar d'on agafo les dades, el -1 pq al vector són 0:3
    if enter(parella[1]):
        radi = dataset['r'][int((parella[1]))] #tot ok
    else:
        radi = (dataset['r'][int((parella[1]+0.5))] + dataset['r'][int((parella[1]+0.5))])/2 #La cosa sidosa
    print(parella[0], radi)
    radis.append((parella[0], radi)) #també mels guardo en un vector
```

```
1 0.223170320032
1 0.16075473742
2 0.232242009707
2 0.231475292139
2 0.193894123642
2 0.133992227476
3 0.202477371532
3 0.187233573519
3 0.132937038275
3 0.110908628434
4 0.222437796569
```

El següent pot tenir una mica de sidilla, radis[i][0] es nomes l'index (1,2,3 o 4), i radis[i][1] al valor de la seva dreta de la cel·la de dalt.

In [120]:

```
len(radis) == len(l) #tot ok? tot ok
```

Out[120]:

```
True
```

In [121]:

```
excentricitats = [(radis[i][0],(np.sqrt(1-((radis[i][1]**2)/(l[i]**2))))) for i in range(len(radis))]
```

In [122]:

```
for i in excentricitats:
    print(i[0],i[1])
```

```
1 0.76713295171
1 0.856169522906
2 0.749271880628
2 0.567176539821
2 0.649583354233
2 0.799292184731
3 0.795909590917
3 0.7298676301
3 0.841203182051
3 0.872452036702
4 0.775304115012
```

RESULTATS FINALS ABANS DE LA REVISIÓ D'EN LLOBERA

Període (s)

1 1.3333333329999997 1 1.5388888890000008 2 1.5999999999999943 2 1.188888888888889 2 1.6388888888888795 2 1.244444444444444 3 1.772222222222217 3 1.372222222222222 3 1.1944444444444402 3 1.3777777777777702 4 1.61666666666666

Perihelion precession (rads/1rev)

1 -2.9032169245858457 1 -1.6640795550695682 2 -2.3185411933930022 2 -2.8464536128942353 2 -1.2265097564268768 2 -1.9167360885572862 3 -1.6557735566743963 3 -2.2502680608697654 3 -2.3990810975874783 3 -1.3861191630590852 4 -2.0059799799955655

Semieixos majors (metres)

1 0.347894693513415 1 0.31112112539639253 2 0.3506796802872085 2 0.281054332025614 2 0.255026405797552 2 0.22297009467388001 3 0.33444365529036946 3 0.273898072417711 3 0.245852281370607 3 0.2269463589800905 4 0.35218807358550297

Excentricitats

1 0.76713295171 1 0.856169522906 2 0.749271880628 2 0.567176539821 2 0.649583354233 2 0.799292184731 3 0.795909590917 3 0.7298676301 3 0.841203182051 3 0.872452036702 4 0.775304115012

In [ ]: