Assignment 2

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Question 1:

Errors ,maxError = MarsEquantModel (c,r,e1,e2,z,s,oppositions)

Explaination:
- The aim is to find the error between the calculated angles and the ones given in the csv file
- All the c and equant polar coorditantes are converted into cartesian coordinates
- Then using the equation for circle and line

$$(X - Cx)^2 + (X - Cy)^2 = R^2$$
$$Y - Ey = (X - Ex) * \tan D$$

and equating together get the quadratic equation formulated.
(here (Cx,Cy) and (Ex,Ey) are cartesian coordinates of c and equants respectively)

- Solving the equation, we get the pair of roots, from which the correct one is chosen by checking it with the quadrant(explained in the code check_choice function)
- from this the angle can be calculated and compared to the angle from the data given
- returns the error made by each opposition and the maximum error out of these

Questoin 2:
c,e1,e2,z,errors,maxError = bestOrbitInnerParams(r,s,oppositions)
Explaination:
- Aim: to find e1,e2,c and z values
- The function contains four for loops which searches extensively in a range of 0 to 360 degrees from c,z and e2 which are angles and between 1 and 2 for e1(from the given constraints)

- The right e1,e2,c and z values are chosen by seeing the values that gave minimum error from the function specified in the first question

Question 3:
s,errors,maxError = bestS(r,oppositions)
Explaination:
- Aim: to find the best s value, given r
- This function is implemented as an extensive search over a limit (specified in the code)
- for getting the optimal s value bestOrbitInnerParams functoin is used, which sends a set of values, which includes the max error
- The value giving the least max error is chosen and returned by the functions

Question 4:
r,errors,maxError = bestR(s,oppositions)
Explaination:
- Aim: to find the best r value, given s
- This function is implemented similar to the bestS functoin but with different limits for doing the extensive search
- The method used to find the optimal **r** is same as of selecting the best s

Quesition 5:
r,s,c,e1,e2,z,errors,maxError = bestMarsOrbitParams(oppositions)
Explaination:
- This function acts as the server functions which uses the rest of the data to find the optimal r,s,e1,e2,z and c values
- s is initialised by 360/687 and a round of bestR and then bestS is called
- This fetches s and r values which are then passed on to the bestOrbitInnerParams function which returns the c,e1,e2,z set of values with the error they make
- The plot is drawn using these values

Results:

The values returned for r,s,c,e1,e2, and z are:

- r : 9.22
- s : 0.52
- c : 144.0
- e1 : 1.66
- e2 : 94.7
- z : 56.8

Graph: