

SOLUTION TO  
A PROBLEM CONCERNING  
ASTRONOMY  
BY THE AUTHOR  
Leonhard Euler

Problem 1

*Given the greatest equation of a planet, discover the eccentricity of its orbit.*

Solution

If the greatest equation were to be converted into minutes and seconds, such their number would be  $= m$ ; I say that the mean distance of the planet from the Sun to the eccentricity will be as 412533 to the number  $m$ ; if indeed the equation will not be too great. But if the equation will be very great, with the posited ratio of the mean distance to the eccentricity as 1 to  $v$ , it will be such  $v = \frac{m}{412533} - \frac{m^7}{32(412533)^7}$ . Q.E.I.

Problem 2

*Given the eccentricity of a planetary orbit, discover the greatest equation.*

Solution

If 1 to  $v$  were to be as a planet's mean distance from the Sun to its eccentricity, and if  $m$  were to be the number of minutes and seconds of the greatest equation, which is the one being sought, I say that it will be  $m = 412533(v + \frac{v^7}{32})$ ; or by logarithms it will be  $\log m = 5,6154596 + \log(v + \frac{v^7}{32})$ . Where it is to be noted that, unless the eccentricity will be exceedingly great in place of the sum quantity  $v + \frac{v^7}{32}$ , only  $v$  can be. Q.E.I.

Problem 3

*Given the eccentricity of a planetary orbit, discover the the mean anomaly to which the greatest equation corresponds.*

Solution

If 1 to  $v$  were to be as the mean distance to the eccentricity, some ratio is therefore given and hence  $v$ . The sinus totus should be multiplied by  $\frac{v^7}{32}$ , and will be made the sine of the very angle to be discovered from the tables: this angle would thus be of  $q$  grades. *This operation will indeed be easily established by means of logarithms.*

Then the logarithm of the quantity  $v + \frac{v^7}{32}$  or only  $v$  itself, if  $v$  will be very small, should be sought from the tables of the logarithm of natural numbers, the logarithm 5,3144295 should be added to this, and the corresponding number of the logarithm that emerges, which is  $n$ , should be sought; where it should be noted that  $n^n$  is half the part of the greatest equation; if the greatest equation will have already been found, work with this aforementioned operation would not even be needed. I say that the mean anomaly in question will be  $90^\circ + q^\circ + n^n$ . Q.E.I.