# Assignment 4

Due: 6:00PM 10/12/23

Purpose: The purpose of this assignment is to have you write a program that allows you to utilize an conditional construct to evaluate a function that is piecewise defined.

Your goal: Write a Fortran program that calculates the apparent magnitude (the brightness) m_{ap} of a binary star system.   The apparent magnitude varies of the binary varies periodically as described by the following formula as a function of time:

$$
m_{ap} = \begin{cases}
2.5 & \text{for } 0 \le t < 0.9 \\
3.335 - \ln\left(1.352 + \cos\left(\frac{\pi(t-0.9)}{0.7}\right)\right) & \text{for } 0.9 \le t < 2.3 \\
2.5 & \text{for } 2.3 \le t < 4.4 \\
3.598 - \ln\left(1.998 + \cos\left(\frac{\pi(t-4.4)}{0.4}\right)\right) & \text{for } 4.4 \le t < 5.2 \\
2.5 & \text{for } 5.2 \le t < 6.4
\end{cases}
$$

thereafter the brightness repeats as described above with a period of 6.4 days.
Your program should prompt the user to enter an arbitrarily large time (in units of days) and output the apparent magnitude.   The apparent magnitude of the binary system as a function of time over several cycles looks like:
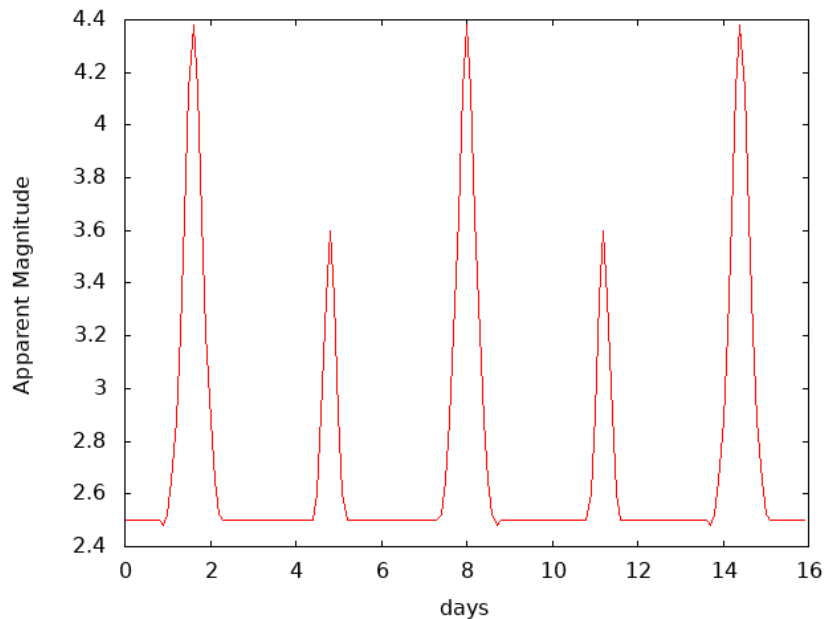
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Hint:

For a user-input value of the time think of how you can compute the phase time (the time into the binary's cycle) in terms of multiples of the period of 6.4 days.
Example:

A input time of 13.4 days = (2 periods) x (6.4 day/period) + 0.6 days
The time into the third cycle (the phase time) would be
0.6 days = 13.4 days –(2 periods x (6.4 days/period)
The phase time value of 0.6 days would be the value of the time used
in the apparent magnitude formula.

Another hint:

Use integer arithmetic to your advantage to compute the phase time used in the formula!

Note:

Make sure that your submission conforms to the **Instructions for Source Code Submission** instructions and that you have followed all of the Good Programming Tips in the notes!