

**EXTRA CREDIT ASSIGNMENT
OPTION #2**

Due 11:59 PM Sunday, Dec. 10 2023

The shortest day of the year is Dec. 21st. However, it is not the day of either the earliest sunset or the date of the latest sunrise. Consider a fictional Earth as a perfect sphere moving in a perfectly spherical orbit. Assume Earth's rotational axis is tilted at 23.5 degrees. Assume the rotational frequency of the fictional Earth as being extremely high (many many days in a year). Derive, as a fraction of a year, how many days the earliest sunset occurs than the winter solstice. This will be the same fraction for how much later the latest sunrise occurs after the solstice. Assume the observer lives in Gaylord, Michigan, which has a latitude of 45 degrees.

Your work and equations must be your own. Copying the derivation from Wikipedia will be insufficient. You must demonstrate a sufficient number of steps so that most students in PHY 321 can follow the steps.