

MATH 2425, Calculus II
Lab 10: Polar Arc Length

Week of November 9, 2009

Flying from the earth to the moon is not so simple, since the moon rotates around the earth. Flying directly to the moon requires precise timing.

Alternatively, one could fly to the moon using a “synchronous” flight path, which means that during the entire flight the spacecraft is aligned directly between the earth and the moon.

For the following questions, assume that a synchronous flight path is chosen. Round off answers to two decimal places.

1. What is the resulting shape of the flight path?
2. Assuming that the straight-line distance between the earth and the moon is always 240,000 miles, and that the distance from the spacecraft to the earth increases at a constant rate of 500 miles per hour, how long does it take the spacecraft to reach the moon?
3. Assuming that the moon orbits the earth once every 27 days, write down a polar equation that gives the position of the spacecraft in terms of the angle made by the orbit of the moon after launch.
4. What is the total distance traveled by the spacecraft in its flight from the earth to the moon? (You may use the table of integrals in the back of the book.)