21-P-FA-AG-014
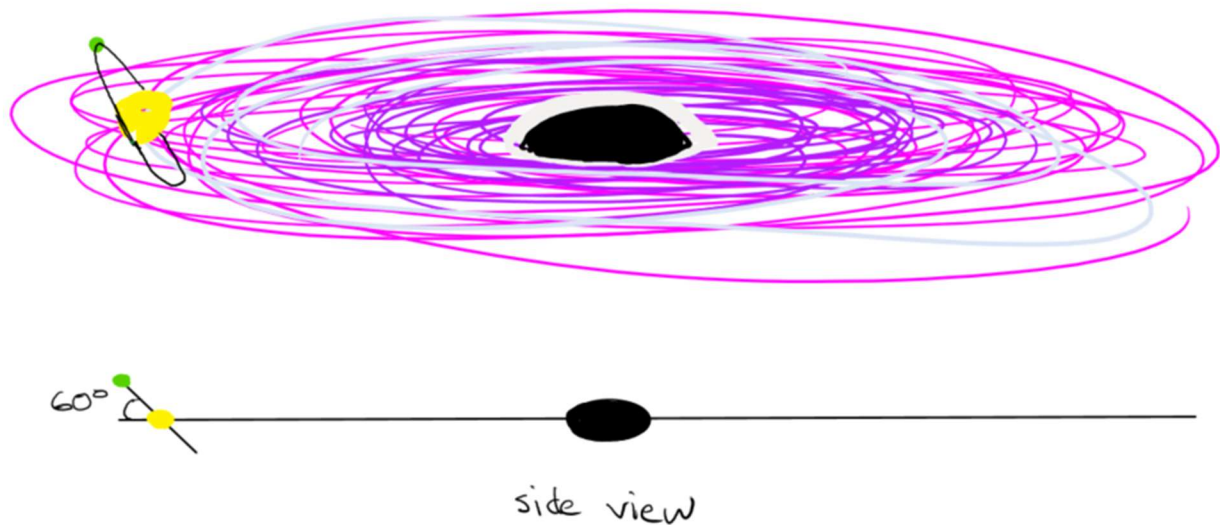

side view

At the equator, the Earth spins at $1{,}670\ \frac{km}{hr}$. The Earth moves at an average speed of $107{,}000\ \frac{km}{hr}$ around the sun. The sun is orbiting the center of the Milky Way galaxy at a speed of $864{,}000\ \frac{km}{hr}$. The sun's orbit around the galactic center is at an angle of 60 degrees with the plane in which the planets rotate around the sun. You are driving at $100\ \frac{km}{hr}$ down a road that happens to go exactly on the equator in the direction opposite the spin of the Earth. At the point when you are furthest away from the galactic center, how fast are you travelling with respect to it?

ANSWER:

The Earth is travelling at a speed of $864{,}000\ \frac{km}{hr} + 107{,}000\ \frac{km}{hr} = 971{,}000\ \frac{km}{hr}$ with respect to the galactic center. A still point on the equator is travelling at a speed of $971{,}000\ \frac{km}{hr} + 1{,}670\ \frac{km}{hr} = 972{,}670\ \frac{km}{hr}$. Since you are driving opposite the direction of the spin, you are travelling at $972{,}670\ \frac{km}{hr} - 100\ \frac{km}{hr} = 972{,}570\ \frac{km}{hr}$ with respect to the galactic center. Since you are at the furthest point away from the center, the angle between the plane of the galaxy and the plane of the solar system doesn't matter because your velocity is perpendicular to the direction of centripetal acceleration.