Definite Integrals, Part 1

The NASA Q36 Robotic Lunar Rover can travel up to 3 hours on a single charge and has a range of 1.6 miles. After *t* hours of traveling, its speed is $v(t)$ miles per hour given by the function $v(t) = \sin\sqrt{9 - t^2}$. In this activity, we will see how to calculate values for the distance traveled as a function of time, even though we won't be able to write that function in terms of elementary functions.

1. Show that the acceleration $a(t) = v'(t)$ which is positive from $t = 0$ to $t = 2.5$.

2. Approximate the distance traveled by the Q36 in the first two hours. Find an error bound for your approximation.

3. Find a more accurate approximation for the distance traveled by the Q36 in the first two hours. Explain how you know it is more accurate.

4. If you haven't already, find an approximation for the distance traveled by the Q36 in the first two hours accurate to a tenth of a mile. Explain how you know it is accurate enough.

5. How small would you need to make Δt to the distance traveled by the Q36 in the first two hours accurate to 5 decimal places?