

INTEGRATION EXTRA CREDIT PROJECTS

For each of these I want you to show the Riemann sum that you're doing and what integral it would turn into. Include a thorough explanation of what you're doing and why; that is, explain the idea behind each of the major steps you're doing.

You may work with up to 1 other person. Each project is worth up to 10 points to the test of your choice.

- Find the volume of a sphere by two different methods:
 - Repeatedly “painting” a point.
 - Slicing the sphere into disks.
- Find the length of a curve by slicing it into smaller curves and using Pythagorean Theorem. Consider a generic curve (find a formula) and at least one specific example.
- Find the volume created by rotating the area between two functions around a horizontal line by slicing the volume into washers.
- Find the volume created by rotating the area between two functions around a vertical line by slicing it into cylindrical shells.
- Find the distance traveled by an object traveling at a non-constant velocity. Consider positive and negative velocities and address displacement vs. distance traveled. What are you slicing in this case?
- Find the total work done to lift an object using a rope or chain that has non-zero mass. What are you slicing in this case? ***[Work = force x distance, and force = mass x acceleration. The only acceleration affecting the object is gravity.]***
- Find the total work done to pump all the water out of a tank. Consider various tank shapes. What are you slicing in this case? ***[See previous note.]***
- Find the total force on a submerged object with flat surfaces. What are you slicing in this case? ***[Force = pressure x area, and pressure = fluid density x gravity x depth]***

