

Problem set – Week 4

WORK ALONG A CURVE, VOLUMES OF SOLIDS OF REVOLUTION

1. The following question is from last year's exam:

Compute the work of the vector field \vec{v}

$$(x, y, z) \mapsto \vec{v}(x, y, z) := (y^2z + 2x, 2xyz, xy^2)$$

along the line segment that goes from $P_1 := (1, 0, 1)$ to $P_2 := (0, 1, 1)$.

2. The following question is from last year's exam:

Compute the volume of the solid of revolution that is obtained by the revolution of the curve

$$y = \frac{1}{\sqrt{1-x^2}}, \quad -\frac{1}{2} \leq x \leq \frac{1}{2}$$

round the x -axis.

3. Consider the area enclosed by the curve

$$y = \frac{1}{\sqrt{1-x^2}}$$

and the line $y = 2/\sqrt{3}$. Compute the volume obtained by revolving this area around the y -axis.

4. Compute the volume of a *torus* (pictured), where the radial cross sections are circles with radius 1, and the centers of these circles trace out a circle of radius 3. (So, the hole in the middle has a radius of 2, and the entire object has a radius of 4.

