

SOLUTION KEY

Section: 71

Name & Surname: _____

Math 120 Spring 2017-2018

Quiz no.: 06

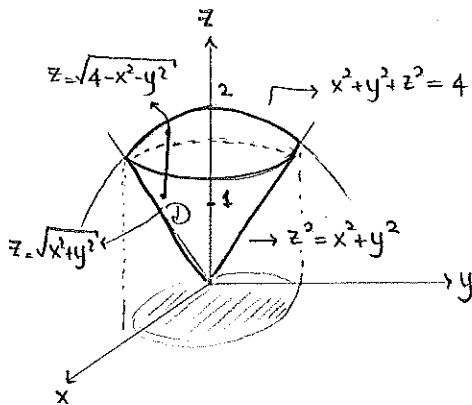
ID Number: _____

Date: 11.05.18

Time Limit: ~15 Minutes

Grade: _____

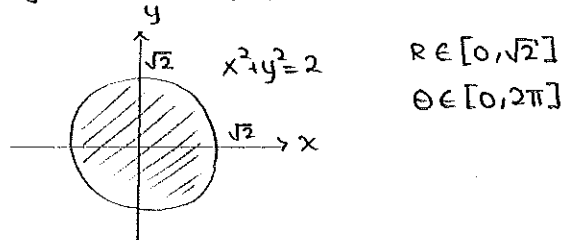
1. Express the volume of the solid \mathcal{D} bounded by $x^2 + y^2 + z^2 = 4$, $z^2 = x^2 + y^2$, and containing the point $(0, 0, 1)$ inside by using iterated integrals in cylindrical coordinates.



In Cylindrical Coordinates :

$$\left. \begin{array}{l} x^2 + y^2 + z^2 = 4 \\ z^2 = x^2 + y^2 \end{array} \right\} 2(x^2 + y^2) = 4 \Rightarrow x^2 + y^2 = 2$$

Projection onto xy -plane:



$$z = \sqrt{x^2 + y^2} = \sqrt{R^2 \cos^2 \theta + R^2 \sin^2 \theta} = R$$

$$z = \sqrt{4 - x^2 - y^2} = \sqrt{4 - R^2}$$

Volume of \mathcal{D} is

$$V = \int_0^{2\pi} \int_0^{\sqrt{2}} \int_R^{\sqrt{4-R^2}} 1 \cdot R \, dz \, dR \, d\theta$$