

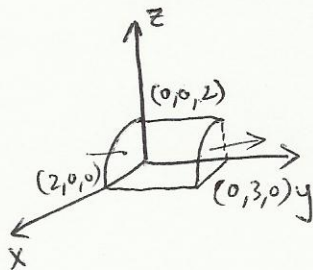
MATH 2850 Sec 007  
 ELEMENTARY MULTIVARIABLE CALCULUS

QUIZ 4

October 25, 2012

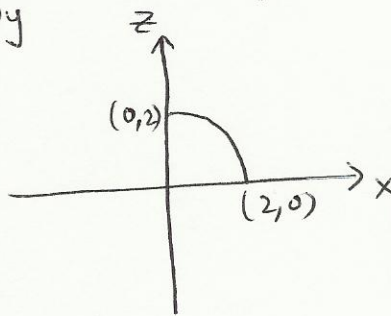
Name (Last, First) Key

1. Write an expression for the volume of the region in the first octant enclosed by the cylinder  $x^2 + z^2 = 4$  and the plane  $y = 3$ .



We take the projection on the  $xz$  plane

Limits for  $y$   
 $0 \leq y \leq 3$



We use polar coordinates

$0 \leq r \leq 2$   
 $0 \leq \theta \leq \frac{\pi}{2}$

$$\int_0^{\pi/2} \int_0^2 \int_0^3 r \, dy \, dr \, d\theta$$

2. Evaluate the above integral and find the volume.

$$\begin{aligned} \int_0^{\pi/2} \int_0^2 \int_0^3 r \, dy \, dr \, d\theta &= 3 \int_0^{\pi/2} \int_0^2 r \, dr \, d\theta \\ &= 3 \int_0^{\pi/2} \left. \frac{r^2}{2} \right|_0^2 d\theta \\ &= 6 \int_0^{\pi/2} d\theta = 6 \cdot \frac{\pi}{2} = \boxed{3\pi} \end{aligned}$$