Name and section: Anirudh Veeraragavan   3F

You will receive one point for attempting the quiz, and one point for each correct answer. Please do your working in the space provided (or on the back) and place your solution in the box.

1. (2 points) Evaluate $\iiint_W z\, dV$ for the region $W : x^2 \le y \le 2, 0 \le x \le 1, x - y \le z \le x + y$. Leave your answer as an iterated integral.

$$\int_{x=0}^{1} \int_{y=x^2}^{2} \int_{z=x-y}^{x+y} z\, dz\, dy\, dx$$

$$\boxed{\int_{x=0}^{1} \int_{y=x^2}^{2} \int_{z=x-y}^{x+y} z\, dz\, dy\, dx}$$

2. (1 point) Convert $y = x^2$ to an equation in polar form: $r = f(\theta)$

$$r\sin\theta = r^2\cos^2\theta$$

$$r = \frac{\sin\theta}{\cos^2\theta} = \tan\theta \sec\theta$$

$$\boxed{r = \tan\theta \sec\theta}$$

3. (2 points) Evaluate $\iiint_W xz \, dV$; where W is the domain bounded by the elliptic cylinder $\frac{x^2}{4} + \frac{y^2}{9} = 1$ and the sphere $x^2 + y^2 + z^2 = 16$ in the first octant $x \geq 0, y \geq 0, z \geq 0$

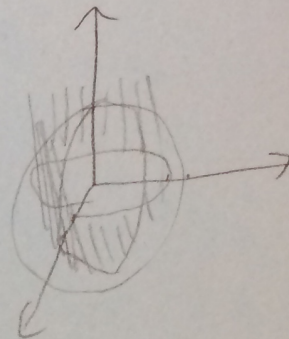**Leave your answer as an iterated integral. You do not need to evaluate the integral**

$z^2 = 16 - x^2 - y^2$

$9x^2 + 4y^2 = 36$

$4y^2 = 36 - 9x^2$

$4 \quad 2 \qquad y^2 = \dfrac{36 - 9x^2}{4}$

$x^2 + y^2 + z^2 = 16$ $\dfrac{x^2}{4} + \dfrac{y^2}{9} = 1$

$x = 4, \; y = 0, \; z = 0$ $x = 2, y = 0$

$z^2 = 16 - x^2 - y^2$, $y^2 = \dfrac{36 - 9x^2}{4}$, $x = 2$

$$\int_{x=0}^{2} \int_{y=0}^{\sqrt{\frac{36-9x^2}{4}}} \int_{z=0}^{\sqrt{16-x^2-y^2}} xz \; dz \; dy \; dx$$