5.4T

5.2.39

$$\int_{-2}^{3}\int_{1}^{2}\int_{y+2}^{2y+2} 6y \, dx \, dz \, dy$$

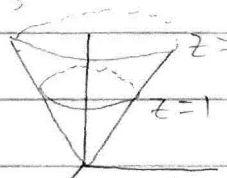
$$\int_{-2}^{3}\int_{1}^{2} 6y(2y+2-y-2)\, dz\, dy$$

$$\int_{-2}^{3}\int_{1}^{2} 6y^2 \, dz\, dy$$

$$\int_{-2}^{3} 6y^2 \, dy$$

$$2y^3\Big]_{-2}^{3} = 54+16 = 70$$

5.4.5



a) $1 \le r \le 2\cos\theta$ b) $1 \le z \le 2$

$0 \le \theta \le \frac{\pi}{4}$ $0 \le \theta \le 2\pi$

$0 \le \phi \le \frac{\pi}{2}$ $r \le z \le 2$

a) $\int_0^{2\pi}\int_0^{\pi/4}\int_{\sec\theta}^{2\cos\theta} \rho^2 \sin\theta \, d\rho \, d\theta \, d\phi$ b) $\int_0^{2\pi}\int_1^2\int_1^z r \, dr \, dz \, d\theta$

$\frac{14\pi}{3}\int_0^{\pi/4} \sec^3\theta \sin\theta \, d\theta$

$-\frac{14\pi}{3}\int_{\sqrt{2}}^{1} \frac{1}{u^3}\, du$

$\frac{7\pi}{3}\left[\frac{1}{u^2}\right]_1^{\sqrt{2}}$

$\frac{7\pi}{3}(2-1)$

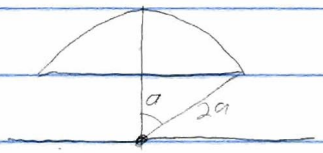
$\frac{7\pi}{3}$

$\frac{2\pi}{2}\int_1^2 z^2 \, dz$

$\frac{\pi}{3}\left[z^3\right]_1^2$

$\frac{7\pi}{3}$

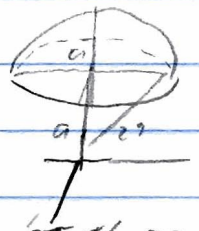
5.4.24



$a\sec\theta \le r \le 2a$

$0 \le \theta \le \frac{\pi}{3}$

$0 \le \phi \le 2\pi$



Since we're dealing with only the z component we take

$$\int \frac{G}{r^2}\cos\theta\,\rho\,dV$$

$$G\rho \int_0^{2\pi}\int_0^{\pi/3}\int_{a\sec\theta}^{2a} \cos\theta\sin\theta\,dr\,d\theta\,d\phi$$

$$2\pi G\rho a \int_0^{\pi/3} 2\cos\theta\sin\theta - \sin\theta\,d\theta$$

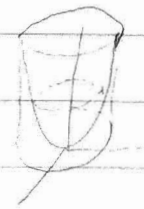
$$2\pi G\rho a \left[\sin^2\theta + \cos\theta\right]_0^{\pi/3}$$

$$2\pi G\rho a \left(\frac{3}{4} + \frac{1}{2} - 1\right)$$

$$2\pi\rho a G\left(\frac{1}{4}\right)$$

$$G\rho a\pi/2$$

5.5.3



$0 \le \theta \le 2\pi$

$0 \le r \le 3$

$$\int_0^{2\pi}\int_0^3 \sqrt{4r^2+1}\, r\, dr\, d\theta$$

$$2\pi \int_0^3 \sqrt{4r^2+1}\, r\, dr \qquad u = 4r^2+1$$

$$\frac{\pi}{4}\int_1^{37} \sqrt{u}\, du \qquad du = 8r\, dr$$

$$\frac{2}{3}\frac{\pi}{4}\left[u^{3/2}\right]_1^{37} \qquad \frac{du}{8} = r\, dr$$

$$\frac{\pi}{6}\left(37^{3/2}-1\right)$$