Homework due 11/01

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Sec. 15.3

3) $\int_0^2 \int_0^1 \int_0^1 x e^{y-2z} \, dz \, dy \, dx = e + e^{-2} - e^{-1} - 1$

5) $\int_0^1 \int_0^3 \int_0^3 (xy - xz - y^2 + yz) \, dz \, dy \, dx = -\frac{27}{4}$

7) $\int_0^a \int_0^b \int_0^c (x+z)^3 \, dz \, dy \, dx = \frac{abc(a+c)(a^2+ac+c^2)}{4}$

9) $\int_0^1 \int_0^x \int_y^x (x+y) \, dz \, dy \, dx = \frac{1}{6}$

11) $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^1 xyz \, dz \, dy \, dx = \frac{1}{16}$

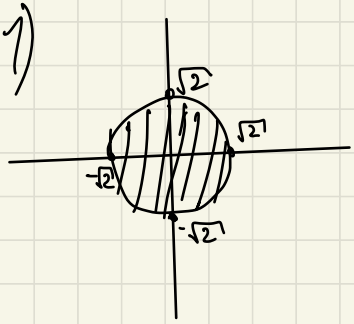
13) $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} e^z \, dz \, dy \, dx = e - \frac{5}{2}$

15) $\int_0^1 \int_0^x \int_0^{\sqrt{9-x^2-y^2}} z \, dz \, dy \, dx = \frac{25}{12}$

17) $\int_0^2 \int_0^{\sqrt{4-x^2}} \int_{y^2}^{8-2x^2-y^2} x \, dz \, dy \, dx = \frac{128}{15}$

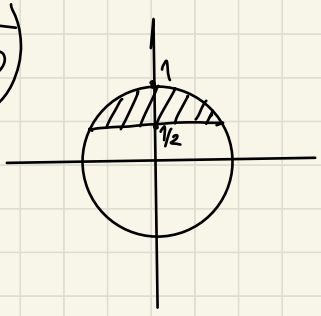
Sec. 15.4

1)



$$\int_0^{2\pi} \int_0^{\sqrt{2}} r \cdot r \, dr \, d\theta = \frac{4\sqrt{2}\pi}{3}$$

5)



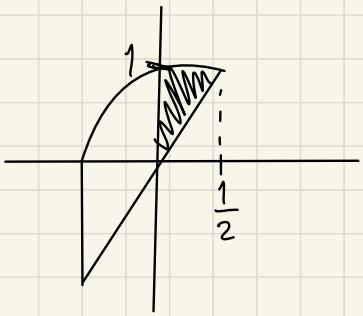
$x^2+y^2=1 \rightarrow r^2=1 \quad r=1$

$y=1/2 \rightarrow r\sin\theta = 1/2 \quad r = \frac{1}{2\sin\theta}$

$1 = \frac{1}{2\sin\theta} \rightarrow \sin\theta = \frac{1}{2} \quad \theta = \frac{\pi}{6}, \frac{5\pi}{6}$

$$\int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \int_{\frac{1}{2\sin\theta}}^{1} \frac{\sin\theta}{r} \, r \, dr \, d\theta = \sqrt{3} - \frac{\pi}{3}$$

9)



$y = \sqrt{3}x \qquad x = \frac{1}{2}$

$r\sin\theta = \frac{\sqrt{3}}{2} \qquad r = 1$

$\theta = \arcsin\left(\frac{\sqrt{3}}{2}\right)$

$\theta = \frac{\pi}{3}$

$$\int_{\frac{\pi}{3}}^{\frac{\pi}{2}} \int_0^1 r\cos\theta \, r\,dr\,d\theta = \frac{1}{3} - \frac{\sqrt{3}}{6}$$

19) $x + y = 1$

$r\cos\theta + r\sin\theta = 1$

$r = \frac{1}{\cos\theta + \sin\theta}$

$$\int_0^{\frac{\pi}{2}} \int_{\frac{1}{\cos\theta+\sin\theta}}^1 (r\cos\theta - r\sin\theta)\, r\,dr\,d\theta = 0$$

27) $$\int_0^{2\pi} \int_0^3 \int_0^5 r^2 \cdot r\,dz\,dr\,d\theta = \frac{405\pi}{2}$$

31) $$\int_0^{2\pi} \int_0^3 \int_{r^2}^9 z \cdot r\,dz\,dr\,d\theta = 243\pi$$

47) $$\int_0^{\pi} \int_0^{2\pi} \int_0^1 \left(\rho^2 - (\rho\cos\phi)^2\right) \cdot \rho^2 \sin\phi \, d\rho\,d\theta\,d\phi = \frac{8\pi}{15}$$

51) $$\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{3}} \int_1^2 (\rho\cos\phi) \cdot \rho^2 \sin\phi \, d\rho\,d\theta\,d\phi = \frac{5\pi}{8}$$