35) $D=40$

$r = \cancel{RO}\ \frac{D}{2} = 20$

$r \in [0, 20]$

$\theta \in [0, 2\pi]$

$h = ay + b$

$h(-20) = 2 \qquad h(20) = 7$

$2 = -20a + b \qquad 7 = 20a + b$

$9 = 2b \qquad 7 = 20a + \frac{9}{2}$

$b = \frac{9}{2}$

$\frac{14}{2} = \frac{40}{2}(a) + \frac{9}{2}$

$\frac{5}{2} = \frac{40}{2}(a)$

$a = \frac{1}{8}$

heigth $= \frac{9}{2} + \frac{1}{8}y = \frac{9}{2} + \frac{1}{8}r\sin\theta$

$y = r\sin\theta$

$\int_0^{2\pi}\int_0^{20} r\left(\frac{9}{2} + \frac{1}{8}r\sin\theta\right)dr\,d\theta = \int_0^{2\pi}\left[\frac{9}{4}r^2 + \frac{1}{24}r^3\sin\theta\right]_0^{20} d\theta$

$= \int_0^{2\pi} 900 + \frac{1000}{3}\sin\theta\, d\theta = 900\theta - \frac{1000}{3}\cos\theta\Big]_0^{2\pi} = 1800\pi - \frac{1000}{3} + \frac{1000}{3}$

$= \boxed{1800\pi}$

39) $\int_{\sqrt{2}/2}^{1}\int_{\sqrt{1-x^2}}^{x} xy\,dy\,dx + \int_1^{\sqrt{2}}\int_0^{x} xy\,dy\,dx + \int_{\sqrt{2}}^{2}\int_0^{\sqrt{4-x^2}} xy\,dy\,dx$

$y = x$

$y = \sqrt{1-x^2}$

$y^2 = 1 - x^2$

$r = 1$

$y = x$

$y = 0$

$y = 0$

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

$y^2 = 4 - x^2$

$r = 2$

$r \in [1, 2]$

$2 = r\sin\theta \qquad \sqrt{2} = r\sin\theta$

$2 = 2\sin\theta \qquad \frac{\sqrt{2}}{2} = \sin\theta$

$\theta = 0 \qquad \theta = \frac{\pi}{4}$

$\theta \in [0, \frac{\pi}{4}]$

$\int_0^{\frac{\pi}{4}}\int_1^2 r^3\sin\theta\cos\theta\, dr\,d\theta$

$\int_0^{\frac{\pi}{4}}\sin\theta\cos\theta\, d\theta \int_1^2 r^3\, dr$

$-\frac{1}{4}\cos 2\theta\Big]_0^{\frac{\pi}{4}}\Big)\left(\frac{1}{4}(16) - \frac{1}{4}\right)$

$-\frac{1}{4}\left[\cos(\frac{\pi}{2}) - 1\right)\left(\frac{15}{4}\right)$

$\frac{1}{4}\left(\frac{15}{4}\right) = \boxed{\frac{15}{16}}$