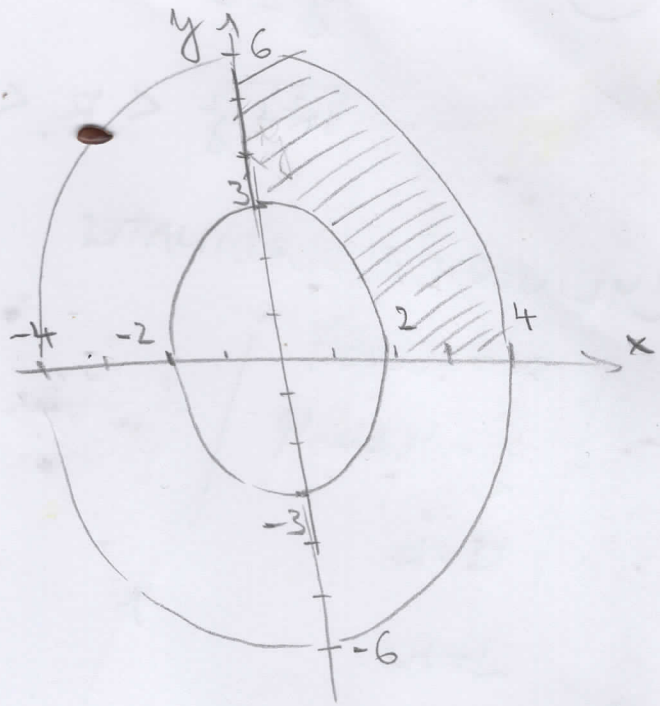
(3.) $\iint_M x\,dA$



$M: \quad 1 \le \frac{x^2}{4} + \frac{y^2}{9} \le 4$

$x \ge 0$
$y \ge 0$

$\frac{x^2}{4} + \frac{y^2}{9} = 4 \quad |:4$

$\frac{x^2}{16} + \frac{y^2}{36} = 1$

$$\iint_M x\,dA = \int_1^2 \int_0^{\frac{\pi}{2}} 2r\cos\varphi \cdot r\,d\varphi\,dr = \int_1^2 2r^2\,dr \cdot \int_0^{\frac{\pi}{2}} \cos\varphi\,d\varphi$$

POLAR COORDINATES: $\begin{vmatrix} x = 2r\cos\varphi \\ y = 3r\sin\varphi \\ J = 6r \end{vmatrix}$

$1 \le r^2 \le 4$

$1 \le r \le 2$ | $0 \le \varphi \le \frac{\pi}{2}$

$$= 2 \cdot \left[\frac{r^3}{3}\right]_1^2 \cdot \left[\sin\varphi\right]_0^{\frac{\pi}{2}} = 2 \cdot \left(\frac{8}{3} - \frac{1}{3}\right) \cdot \underbrace{\left(\sin\frac{\pi}{2} - \sin 0\right)}_{=1-0}$$

$$= \frac{14}{3}$$