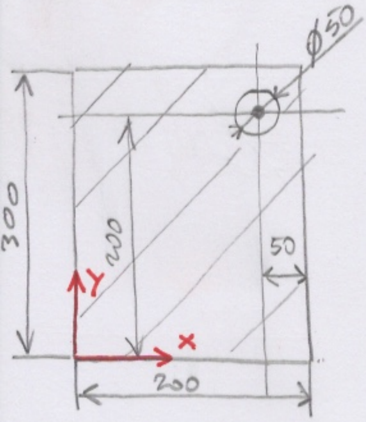
GEOM. DELLE AREE "PIASTRA FORATA" R → rettangolo C → cerchio ①




$A_R = 200 \cdot 300 = 60000 \text{ mm}$

$A_C = \dfrac{\pi D^2}{4} = 1963.4954 \text{ mm}$

CALCOLO BARICENTRO (PIENO − VUOTO)

RETTANGOLO

$S_{xR} = A_R \cdot y_{GR} = A_R \cdot 150 = 9000000 \text{ mm}^3$

$S_{yR} = A_R \cdot x_{GR} = A_R \cdot 100 = 6000000 \text{ mm}^3$

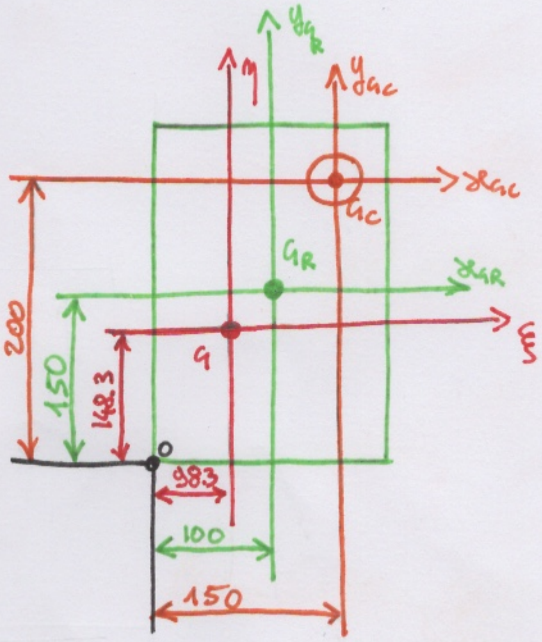
CERCHIO

$S_{xC} = A_C \cdot y_{GC} = A_C \cdot 200 = 392699.0817 \text{ mm}^3$

$S_{yC} = A_C \cdot x_{GC} = A_C \cdot 150 = 294524.3113 \text{ mm}^3$

$\overline{Y}_G = \dfrac{S_{xR} - S_{xC}}{A_R - A_C} = 148.3084 \text{ mm}$

$\overline{X}_G = \dfrac{S_{yR} - S_{yC}}{A_R - A_C} = 98.3084 \text{ mm}$




SPOSTO IL SISTEMA DI RIF SUL BARICENTRO.
ORA IL SIST. DI RIF È $\{G \xi \eta\}$

CALCOLO MOM. INERZIA.

RETTANGOLO (BARIC.) $\{G_R x_{GR} y_{GR}\}$

$J_{xGR} = \dfrac{200 \cdot 300^3}{12} = 450'000'000 \text{ mm}^4$

$J_{yGR} = \dfrac{300 \cdot 200^3}{12} = 200'000'000 \text{ mm}^4$

CERCHIO (BARIC.) $\{G_C x_{GC} y_{GC}\}$

$J_{xGC} = J_{yGC} = \dfrac{\pi D^4}{64} = \dfrac{\pi \cdot 50^4}{64} = 306796.1576 \text{ mm}^4$

MOM. INERZIA BARICENTRICI (PIENO- VUOTO)

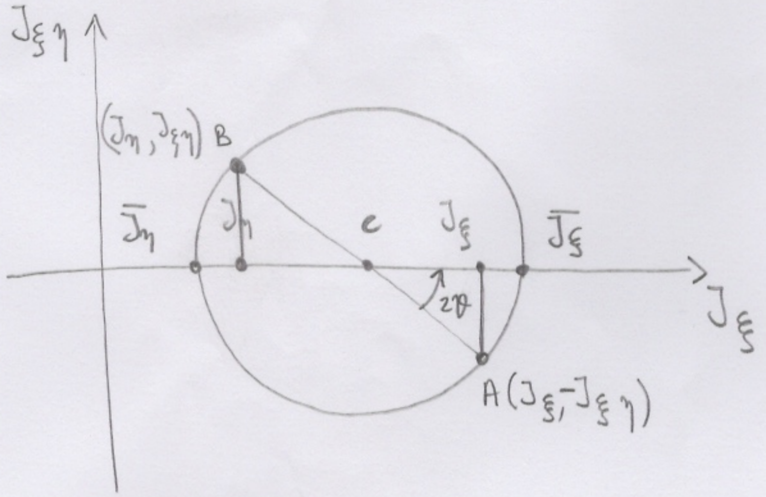
$$J_\xi = J_{xGR} + A_R(150-148.3084)^2 - \left[J_{xGC} + A_C(200-148.3084)^2\right] = \underline{444'618'392.5086\ mm^4}$$

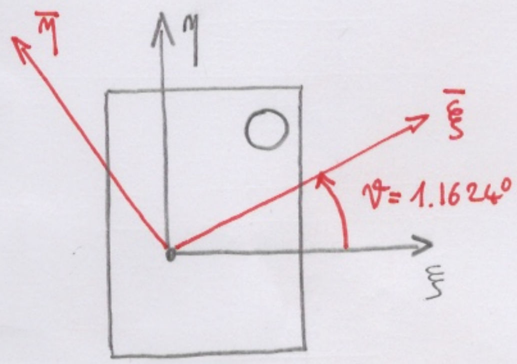
$$J_\eta = J_{yGR} + A_R(100-98.3084)^2 - \left[J_{yGC} + A_C(150-98.3084)^2\right] = \underline{194'618'392.5086\ mm^4}$$

$$J_{\xi\eta} = \emptyset + A_R(100-98.3084)(150-148.3084) - \left[\emptyset + A_C(150-98.3084)(200-148.3084)\right] =$$

$$= \underline{-5'074'811.3338}\ mm^4$$

CERCHIO DI MOHR $J_\xi > J_\eta \rightarrow A(J_\xi, -J_{\xi\eta})$




$$c = \frac{J_\xi + J_\eta}{2} = 319'618'392.5086\ mm^4 \qquad R = \sqrt{(J_\xi - c)^2 + J_{\xi\eta}^2} = 125'102'972.4270\ mm^4$$

$$\bar{J}_\xi = \overset{C+R}{} 444'721'364.9357\ mm^4$$

$$\bar{J}_\eta = C - R = 194'515'420.0816\ mm^4$$

$$2\vartheta = \operatorname{atan}(J_{\xi\eta}, J_\xi - c) = 2.3249° \rightarrow \vartheta = 1.1624°$$

Verifico con la formula $\vartheta = \frac{1}{2}\operatorname{atan}\left(\frac{2J_{\xi\eta}}{J_\eta - J_\xi}\right) = \underline{1.1624°}$ $\oplus$ → quindi antiorario corretto