Remarks: See §3.1.4, example 3, pages 85 till 86
See §3.3.2, example 2, pages 126 till 129

Answers:

a. $A = 2Rt\alpha$

b. $S_y = 2R^2 t \sin\alpha$

$S_z = 0$

c. $y_C = \dfrac{R\sin\alpha}{\alpha}$

$z_C = 0$

d. $I_{yy} = \dfrac{R^3 t}{2}(2\alpha + \sin 2\alpha)$

$I_{zz} = \dfrac{R^3 t}{2}(2\alpha - \sin 2\alpha)$

$I_{yz} = I_{zy} = 0$

e. $I_{yy;centr} = \dfrac{R^3 t}{2}(\sin 2\alpha + 2\alpha) - \dfrac{2R^3 t \sin^2\alpha}{\alpha}$

$I_{zz;centr} = \dfrac{R^3 t}{2}(2\alpha - \sin 2\alpha)$

$I_{yz;centr} = I_{zy;centr} = 0$

Check Answers:

$\alpha = \dfrac{\pi}{2}$ (half ring):

$A = \pi Rt\ ;\ S_y = 2R^2 t\ ;\ S_z = 0$

$y_C = \dfrac{2R}{\pi}$ and $z_C = 0$

$I_{yy} = I_{zz} = \dfrac{\pi R^3 t}{2}$ and $I_{yz} = I_{zy} = 0$

$I_{yy;centr} = \left(\dfrac{\pi}{2} - \dfrac{4}{\pi}\right) R^3 t$ and $I_{zz;centr} = \dfrac{\pi R^3 t}{2}$

$I_{yz;centr} = I_{zy;centr} = 0$

$\alpha = \pi$ (complete ring):

$A = 2\pi Rt\ ;\ S_y = S_z = 0$

$y_C = z_C = 0$

$I_{yy} = I_{zz} = \pi R^3 t$ and $I_{yz} = I_{zy} = 0$

$I_{yy;centr} = I_{zz;centr} = \pi R^3 t$

$I_{yz;centr} = I_{zy;centr} = 0$