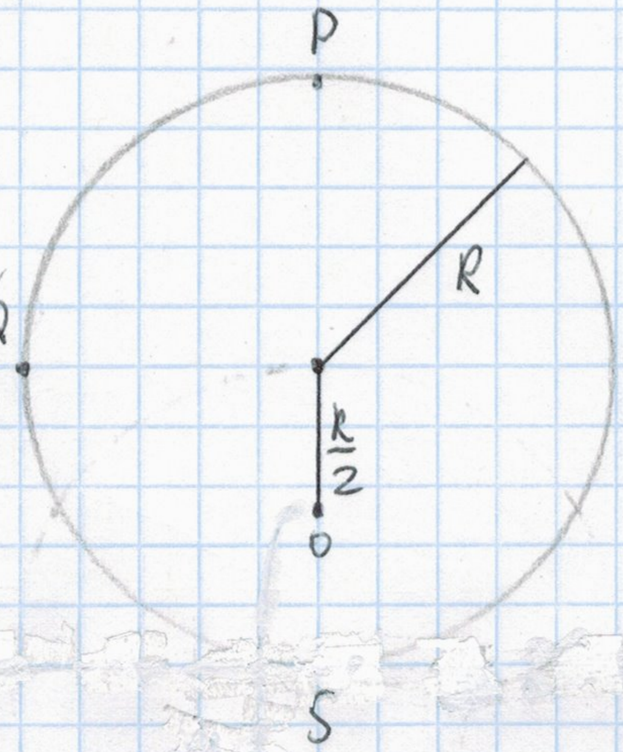
3.11 Michał Porębski (20) 2c

R, d



$J = J_0 + Md^2$ - liczba momentu bezwładności tarczy względem osi Q

$J_0 = \frac{1}{2}mR^2$ 2 tw. Steinera

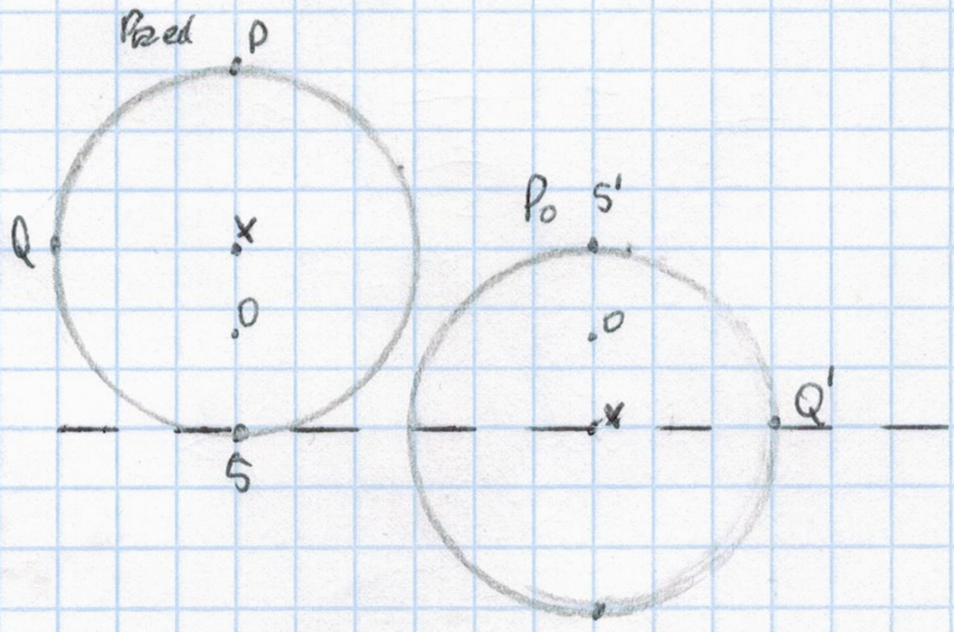
$d = \frac{R}{2}$

$J = \frac{1}{2}mR^2 + m \cdot \frac{R^2}{2}$

$J = m\left(\frac{1}{2}R^2 \cdot \frac{R^2}{2}\right)$

$J = \frac{3}{4}mR^2$ - moment bezwładności tarczy względem osi obrotu O

a)



Przyjmujemy poziom zero w punkcie S

Dla środka ciężkości

$E_{k_1} = 0$

$E_p = m \cdot g \cdot R$

$E_{k_2} = \frac{1}{2} \cdot \frac{3}{4}mR^2 \cdot \omega^2$

$E_{k_2} = 0$

Zapiszmy energię środka ciężkości przed i po

$E_{k_1} + E_{p_1} = E_{k_2} + E_{p_2}$

$0 + mgR = \frac{3}{8} \cdot mR^2 \cdot \omega^2$

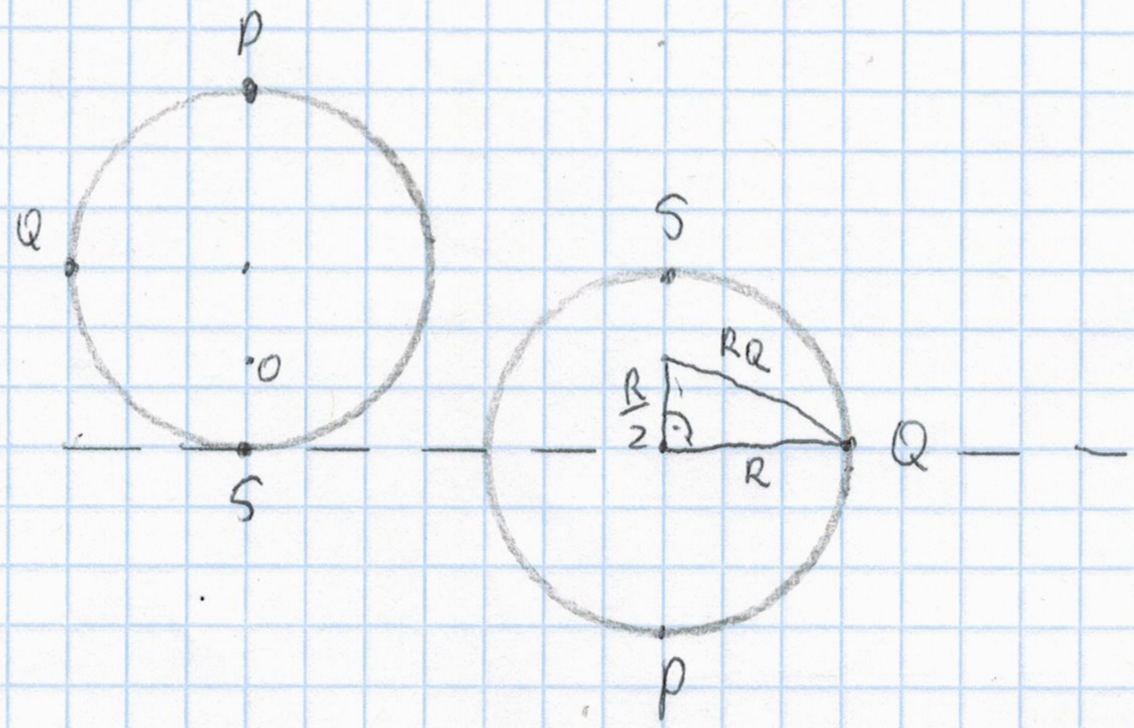
$g = \frac{3}{8}R\omega^2 \quad / \cdot 8$

$8g = 3R\omega^2 \quad / : 3R$

$\omega^2 = \frac{8g}{3R} \quad / \sqrt{\ }$

$\omega = \sqrt{\frac{8g}{3R}}$

b)



Dla pkt Q

$$v = \omega \cdot R_Q \longrightarrow R_a^2 = R^2 + \left(\frac{R}{2}\right)^2 \qquad \omega = \sqrt{\frac{8g}{3R}}$$

$$v = \sqrt{\frac{8g}{3R}} \cdot \frac{\sqrt{5}R}{2} =$$

$$R_a^2 = \frac{5}{4}R^2$$

$$R_a = \sqrt{\frac{5}{4}R^2}$$

$$R_a = \frac{\sqrt{5}R}{2}$$

$$= \sqrt{\frac{28g\ 5R^2}{3R \cdot 4}} = \sqrt{\frac{10}{3}}\, g \cdot R$$

Dla pkt P

$$R_p = \frac{3}{2}R$$

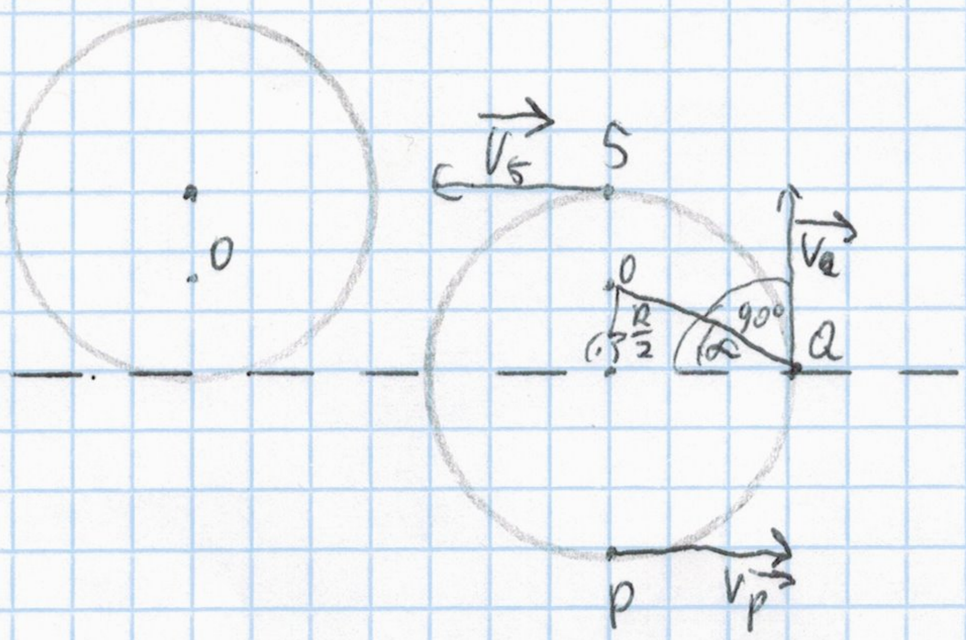
$$v = \omega \cdot R_p = \sqrt{\frac{2^1 8g}{3R}} \cdot \frac{^3 9R}{4} = \sqrt{6gR}$$

Dla pkt S

$$R_S = \frac{1}{2}R$$

$$v = \omega \cdot R_S = \sqrt{\frac{2^1 8g}{3R}} \cdot \frac{R^2}{4_1} = \sqrt{\frac{3}{3}gR}$$

c)



$\sphericalangle(k, \vec{V_P}) = 0°$

$\sphericalangle(k, \vec{V_S}) = 0°$

$\sin\alpha = \frac{\frac{R}{2}}{\frac{\sqrt{5}R}{2}} = \frac{R}{2} \cdot \frac{2}{\sqrt{5}\cdot R} \approx 0{,}447$

$\alpha \approx 27°$

$\sphericalangle(k, V_Q) \approx 63°$