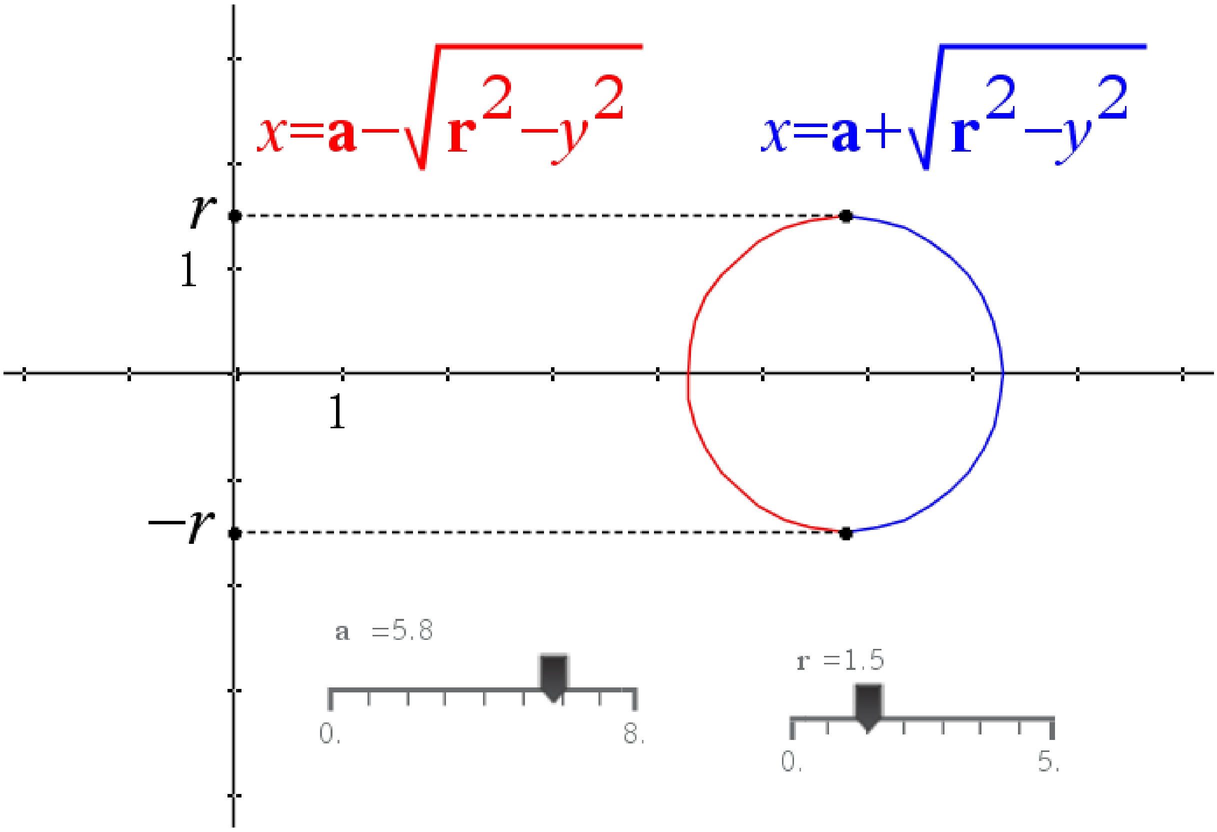

Wentelvolume rechter halve cirkel   min   wentelvolume linker halve cirkel =

$$\pi\cdot\int_{-r}^{r}\left(a+\sqrt{r^2-y^2}\right)^2 \mathrm{d}y-\pi\cdot\int_{-r}^{r}\left(a-\sqrt{r^2-y^2}\right)^2 \mathrm{d}y \qquad 2\cdot a\cdot\pi^2\cdot r\cdot|r|$$

Maar r > 0, dus wentelvolume = $2.a.\pi^2.R^2$

Zijdelingse oppervlakte bij wenteling om de y-as: $2.\pi.\int_{x1}^{x2} g(y).\sqrt{1+g'(y)^2}\,.\,dy$

Hierin is y = f(x) omgevormd tot x = g(y).

Totale wenteloppervlakte torus = wenteloppervlakte buitenste halve cirkel plus wenteloppervlakte binnenste halve cirkel:

$g1(y):=a+\sqrt{r^2-y^2}$ *Done*

$g2(y):=a-\sqrt{r^2-y^2}$ *Done*

$$2\cdot\pi\cdot\int_{-r}^{r}\left(g1(y)\cdot\sqrt{1+\left(\frac{d}{dy}(g1(y))\right)^2}\right)dy+2\cdot\pi\cdot\int_{-r}^{r}\left(g2(y)\cdot\sqrt{1+\left(\frac{d}{dy}(g2(y))\right)^2}\right)dy$$

$$4\cdot\pi\cdot\int_{0}^{r}\left(\sqrt{\frac{-1}{y^2-r^2}}\cdot\left(\sqrt{r^2-y^2}+a\right)\right)dy\cdot|r|-4\cdot\pi\cdot\int_{0}^{r}\left(\sqrt{\frac{-1}{y^2-r^2}}\cdot\left(\sqrt{r^2-y^2}-a\right)\right)dy\cdot|r|$$

Jammer, het rekentoestel geeft als oplossing opnieuw de opgave.

We moeten het rekentoestel dus helpen:

$g1(y)\cdot\sqrt{1+\left(\frac{d}{dy}(g1(y))\right)^2}$	$\sqrt{\frac{-1}{y^2-r^2}}\cdot\left(\sqrt{r^2-y^2}+a\right)\cdot\|r\|$
$g2(y)\cdot\sqrt{1+\left(\frac{d}{dy}(g2(y))\right)^2}$	$-\sqrt{\frac{-1}{y^2-r^2}}\cdot\left(\sqrt{r^2-y^2}-a\right)\cdot\|r\|$

We weten dat r > 0 is.

Dus: $2\pi.\int_{-r}^{r}\left(r+\frac{r.a}{\sqrt{r^2-y^2}}\right).dy \quad + \quad 2\pi.\int_{-r}^{r}\left(-r+\frac{r.a}{\sqrt{r^2-y^2}}\right).dy \quad = \quad 2\pi.\int_{-r}^{r}\frac{2.r.a}{\sqrt{r^2-y^2}}.dy$

$2\cdot\pi\cdot 2\cdot r\cdot a\cdot\int_{-r}^{r}\frac{1}{\sqrt{r^2-y^2}}\,dy$	$4\cdot a\cdot\pi^2\cdot\|r\|$

= $4a\pi^2R$