

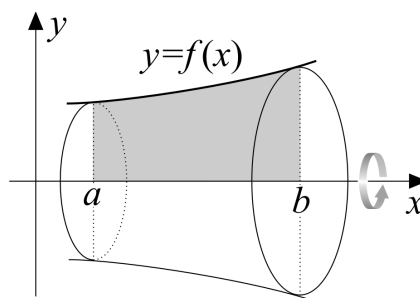
## Volumes of solids of revolution by integration

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### Volumes of solids formed by rotating around the X-axis and horizontal lines

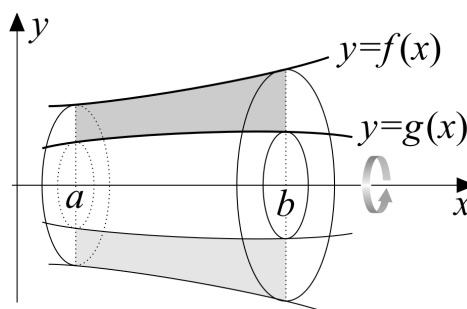
Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $x=a$ ,  $x=b$ ,  $y=0$  around the X-axis

$$V = \pi \int_a^b [f(x)]^2 dx$$



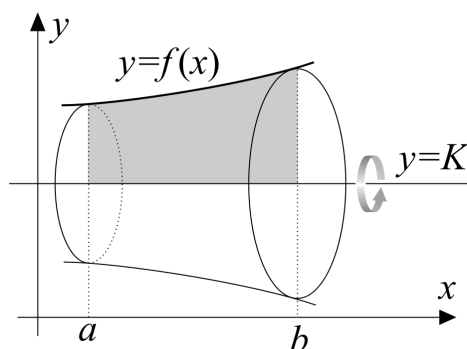
Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $y=g(x)$ ,  $x=a$ ,  $x=b$  around the X-axis, where  $f(x) \geq g(x)$

$$V = \pi \int_a^b \left( [f(x)]^2 - [g(x)]^2 \right) dx$$



Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $x=a$ ,  $x=b$ ,  $y=K$  around the horizontal line  $y=K$

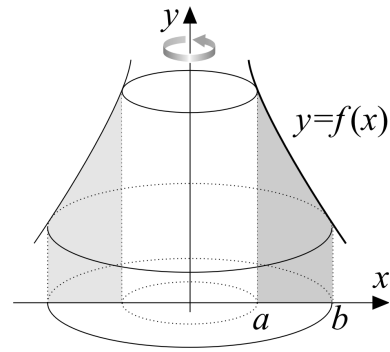
$$V = \pi \int_a^b [f(x) - K]^2 dx$$



## Volumes of solids formed by rotating around the $Y$ -axis and vertical lines

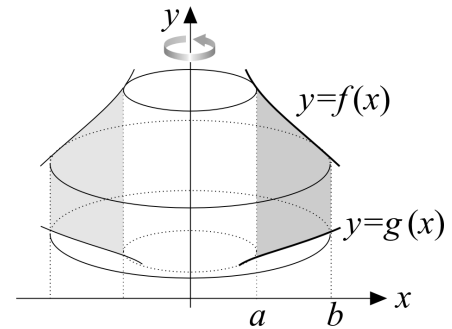
Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $x=a$ ,  $x=b$ ,  $y=0$  around the  $Y$ -axis

$$V = 2\pi \int_a^b |x| f(x) dx$$



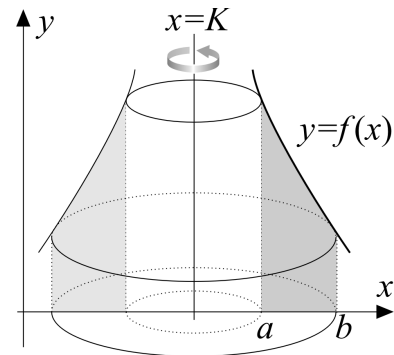
Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $y=g(x)$ ,  $x=a$ ,  $x=b$  around the  $Y$ -axis, where  $f(x) \geq g(x)$

$$V = 2\pi \int_a^b |x| [f(x) - g(x)] dx$$



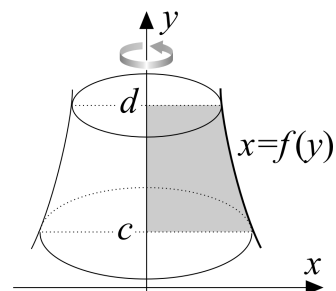
Volume of the solid formed by rotating the area between the curves  $y=f(x)$ ,  $x=a$ ,  $x=b$ ,  $y=0$  around the vertical line  $x=K$

$$V = 2\pi \int_a^b |x - K| f(x) dx$$



Volume of the solid formed by rotating the area between the curves  $x=f(y)$ ,  $y=c$ ,  $y=d$ ,  $x=0$  around the  $Y$ -axis

$$V = \pi \int_c^d [f(y)]^2 dy$$



Volume of the solid formed by rotating the area between the curves  $x=f(y)$ ,  $x=g(y)$ ,  $y=c$ ,  $y=d$  around the  $Y$ -axis, where  $f(y) \geq g(y)$

$$V = \pi \int_c^d ([f(y)]^2 - [g(y)]^2) dy$$

