arctan

$$\int \frac{dx}{x^2+9}$$

$$\int \frac{du}{u^2+1} = \tan^{-1} u$$

Let $u = \frac{x}{3}$

$$du = \frac{1}{3}\,dx$$

$$dx = 3\,du$$

$$\frac{1}{9}\int \frac{dx}{\frac{x^2}{9}+1}$$

$$\frac{1}{9}\int \frac{3\,du}{u^2+1} = \frac{1}{3}\int \frac{du}{u^2+1} = \frac{1}{3}\tan^{-1}\left(\frac{x}{3}\right) + C$$

$$V = \int_a^b A(x)\,dx$$

$a = 0$ $\quad A(x) = x^2$

$b = 3$

$$V = \int_0^3 x^2\,dx$$

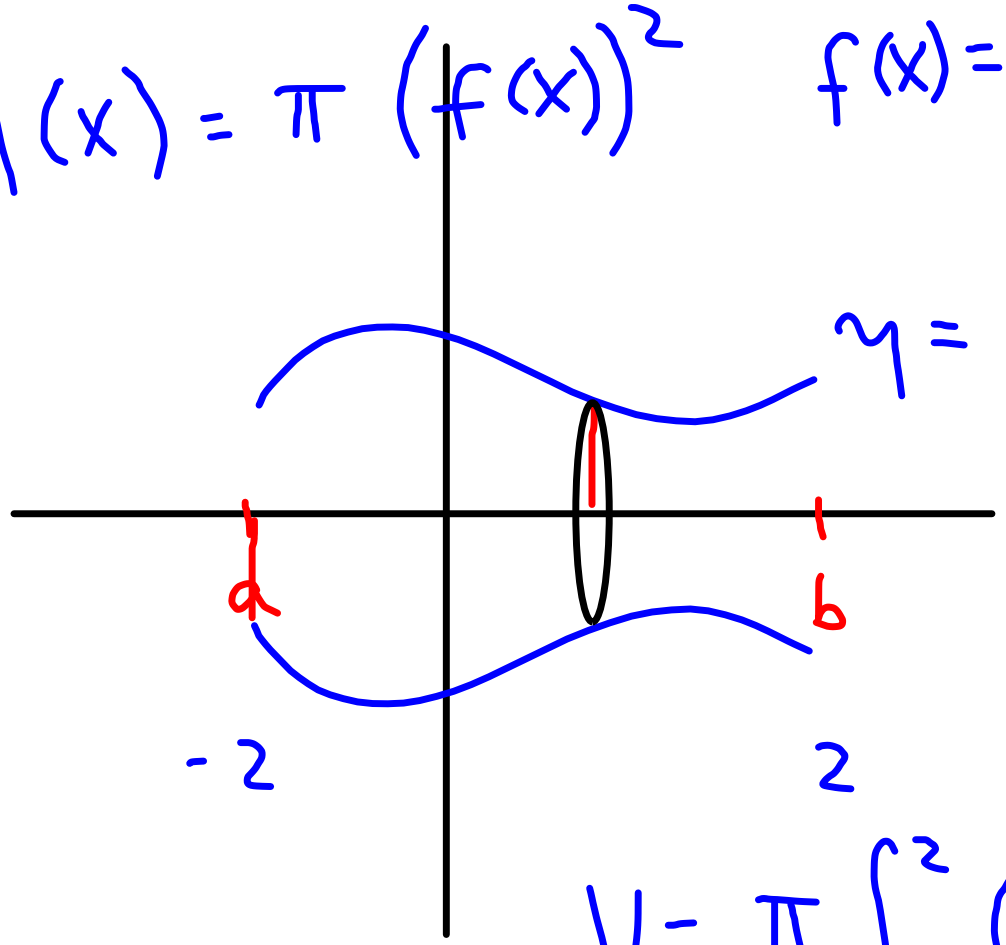
$$= \frac{x^3}{3}\Big|_0^3$$

$$= 9 - 0$$

$$= 9$$

$A(x) = \pi \left(f(x)\right)^2$

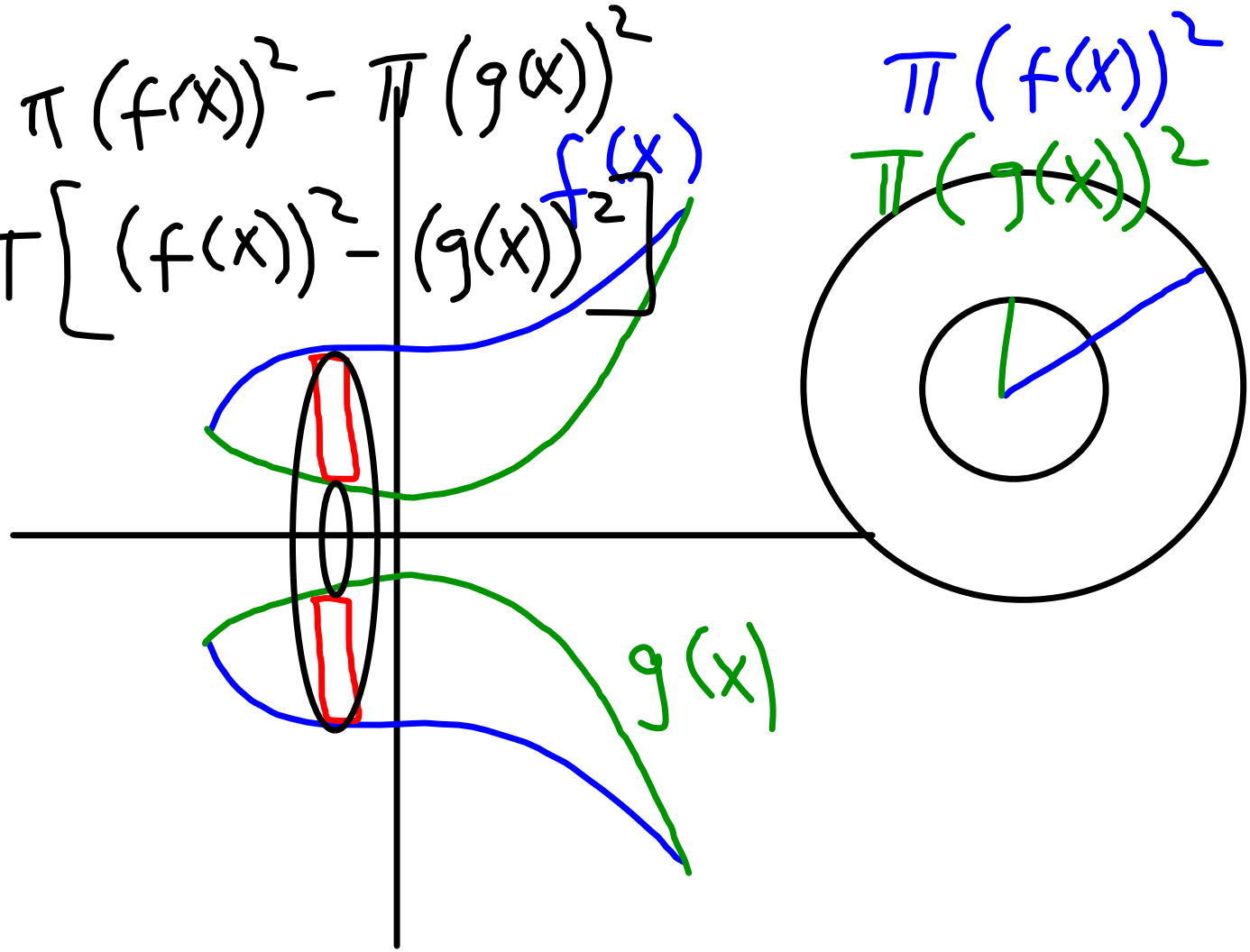
$f(x) = 2 + x\cos x$



$$V = \pi \int_{-2}^{2} \left(2 + x\cos x\right)^2 dx$$

$$A(x) = \pi (f(x))^2 - \pi (g(x))^2$$

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



(1) Understand the shape.

(2) Find A(x) (the cross section area function)

(3) Find the bounds of integration

(4) integrate