C12 - 4.1 - Integration Notes

C!

Basic Rules

$\int kdx = kx + c \qquad (k:\ a\ constant) \qquad \int 5dx = 5x + C$

Power Rule

$\int x^n dx = \frac{x^{n+1}}{n+1} + C \qquad (n \neq -1)$

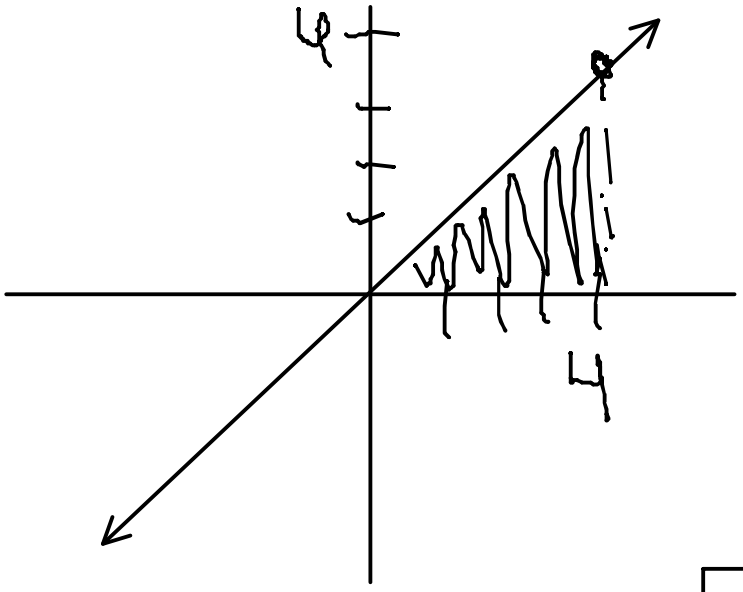
$\int 3x^2 dx = \frac{3x^{2+1}}{3} + C = x^3 + C$

$\int x^2 dx = \frac{x^{2+1}}{3} + C = \frac{x^3}{3} + C$

C12 - 4.2 - Area Notes

Find the area under the curve using Integration. Confirm the area by geometry.

$y = x$ $\quad 0 \leq x \leq 4$



$$\int_0^4 x\,dx = \frac{x^2}{2}$$

$$= \frac{(4)^2}{2} - \frac{(0)^2}{2}$$

$= 8$

FUNDAMENTAL THEOREM OF CALCULUS

$$A = \int_a^b f(x)dx = F(b) - F(a)$$

$F(x)$ *is the antiderivative of* $f(x)$

$$A = \frac{bh}{2}$$

Area of a triangle

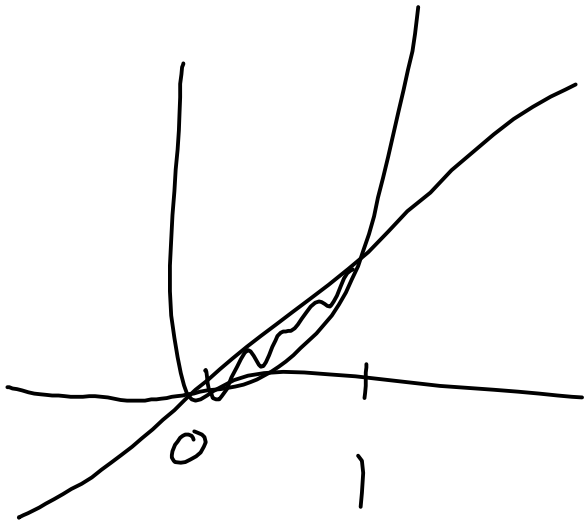
$$A = \frac{4 \times 4}{2}$$

$A = 8$

C12 - 4.2 - Area Between Notes

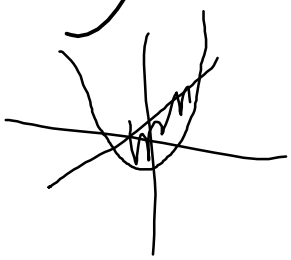
$y = x$

$y = x^2$



$$\int_0^1 x - \int_0^1 x^2$$

$$\int_0^1 x - x^2$$

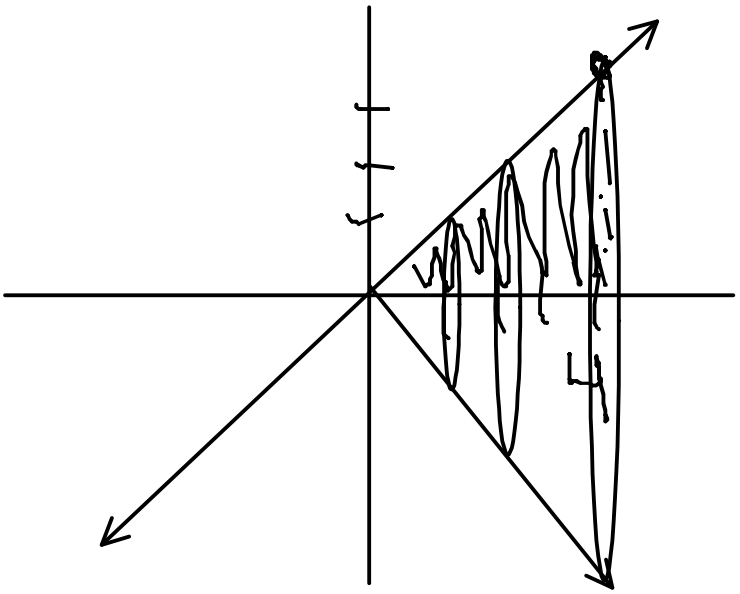


$$\int x + 1 - (x^2 - 1)$$

C12 - 4.3 - Volume Notes

Find the Volume. Then prove the Volume of a cone.

$y = x$ $\quad 0 \le x \le 4$



$$V = \int \pi r^2 dx$$

$$V = \pi \int x^2 dx$$

$r = y = x$ $\quad radius\ is\ the\ y\ height$

$$V = \pi \frac{x^3}{3}$$

$$V = \pi \left(\frac{4^3}{3} - \frac{0^3}{3} \right)$$

$$V = \frac{64\pi}{3}$$

Volume

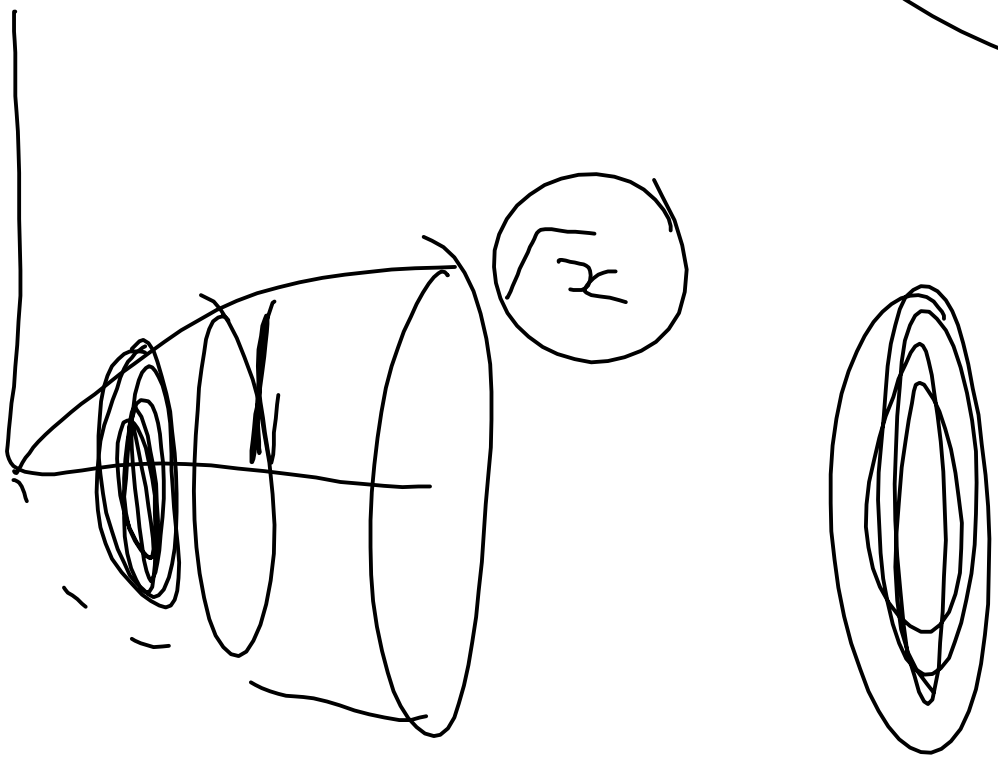
$$V = \int_a^b A(x) dx$$

$$V_{cone} = \frac{1}{3} \pi r^2 h$$

$$V_{cone} = \frac{1}{3} \pi y^2 x$$

C11 - 4.3 - Volume Vase discs

$$\pi \int r^2 dy$$



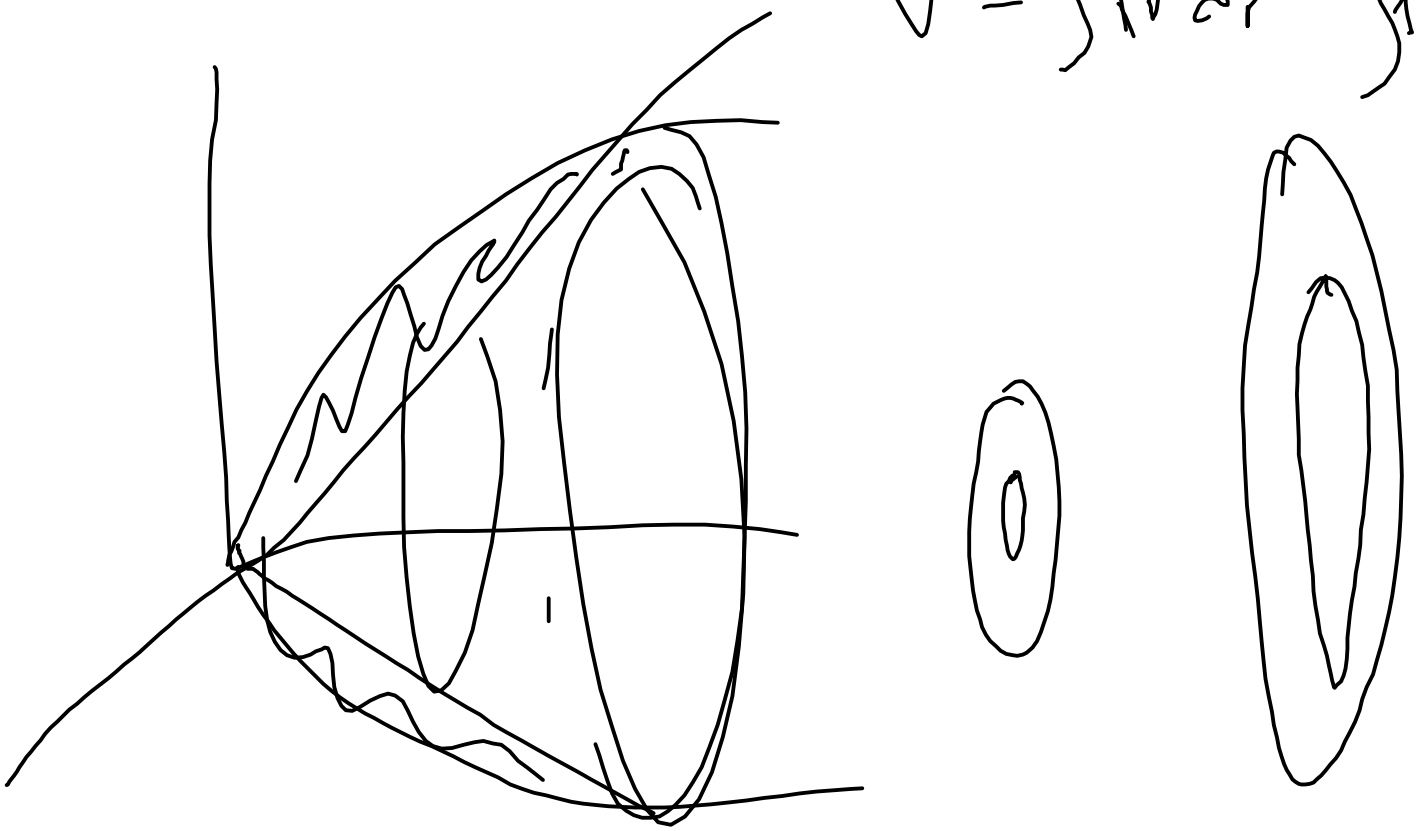
$$\int_0^4 \pi (\sqrt{x})^2 dx$$

$$\pi \frac{x^2}{2} \Big|_0^4 = 8\pi - 0$$

$$V$$

C12 - 4.3 - Volume Between Washers

$$V = \int \pi r^2 \, dr - \int \pi r^2 \, dr$$



$$\pi \int \left(r_{outer}^2 - r_{inner}^2 \right)$$