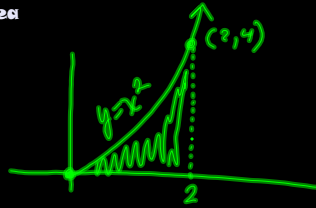


Please put your HW in the tray.

Find the EXACT area

$$1) \int_0^2 x^2 dx$$



$$\Delta x = \frac{b-a}{n}$$

$$\Delta x = \frac{2-0}{n} = \frac{2}{n}$$

$$x_i = a + i\Delta x$$
$$= 0 + i \cdot \frac{2}{n}$$

$$x_i = \frac{2i}{n}$$

$$f(x_i) = \left(\frac{2i}{n}\right)^2 = \frac{4i^2}{n^2}$$

$$A = \Delta x \cdot f(x_i)$$

$$A = \frac{2}{n} \left(\frac{4i^2}{n^2}\right)$$

$$\sum_{i=1}^n \frac{8i^2}{n^3}$$

$$\frac{8}{n^3} \left[\sum_{i=1}^n i^2 \right]$$

$$\lim_{n \rightarrow \infty} \frac{8}{n^3} \cdot \frac{n(n+1)(2n+1)}{6}$$

$$\lim_{n \rightarrow \infty} \frac{8}{n^2} \cdot \frac{1}{6} (2n^2 + 3n + 1)$$

$$\lim_{n \rightarrow \infty} \frac{8n^2 + 12n + 4}{3n^2}$$

$$\lim_{n \rightarrow \infty} \left(\frac{8}{3} + \frac{4}{n} + \frac{4}{3n^2} \right) = \frac{8}{3}$$

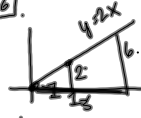
$$\int_0^2 x^2 dx = \frac{8}{3}$$

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

$$\int_0^2 x^2 dx = \frac{8}{3}$$

Graph $y=2x$ on $[0,6]$.

$$F(x) = \int_0^x 2t dt$$



x	0	1	2	3	4	5	6	x
F(x)	0	1	4	9	16	25	36	x^2

$$\int 2t dt = t^2 + C$$

$$\int_0^x \cos t dt = \sin x$$

The Fundamental Theorem of Calculus
If a function f is continuous on
 $[a,b]$ and F is an antiderivative
of f on $[a,b]$, then

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

$$\int_0^2 x^2 dx$$

Use FTC.

$$f(x) = x^2$$

$$F(x) = \frac{x^3}{3} + C$$

$$F(2) = \frac{2^3}{3} + C$$

$$F(0) = \frac{0^3}{3} + C$$

$$F(2) - F(0) = \frac{2^3}{3} + C - \left(\frac{0^3}{3} + C\right) = \frac{8}{3}$$

$$\int_0^2 x^2 dx = \frac{x^3}{3} \Big|_0^2 = \frac{2^3}{3} - \frac{0^3}{3} = \frac{8}{3}$$

From test: $\int_{-2}^2 (4-x^2) dx = 2 \int_0^2 (4-x^2) dx$

Use FTC:

$$2 \int_0^2 (4-x^2) dx = 2 \left(4x - \frac{x^3}{3}\right) \Big|_0^2$$

$$2 \left(4 \cdot 2 - \frac{2^3}{3}\right) - 2 \left(4 \cdot 0 - \frac{0^3}{3}\right)$$

$$2 \left(8 - \frac{8}{3}\right)$$

$$2 \left(\frac{16}{3}\right)$$

$$\frac{32}{3}$$

Check w/calc.

Use FTC: $\int_{-1}^3 (3x^2 - 2x - 1) dx$

$$= x^3 - x^2 - x \Big|_{-1}^3$$

$$= 3^3 - 3^2 - 3 - ((-1)^3 - (-1)^2 - (-1))$$