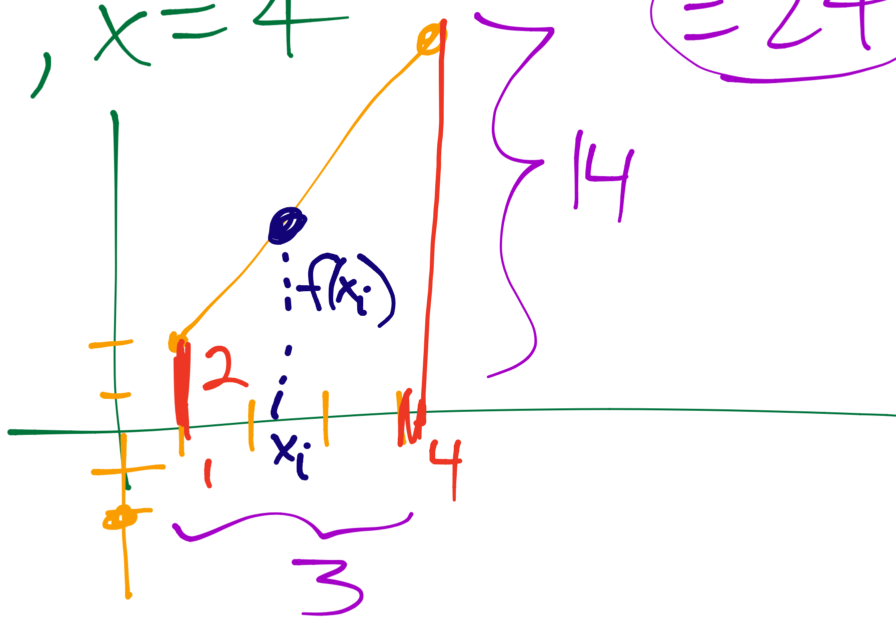
$f(x) = 4x - 2$

$x = 1, \ x = 4$

$A = \frac{1}{2} \cdot 3(16)$

$= 24$

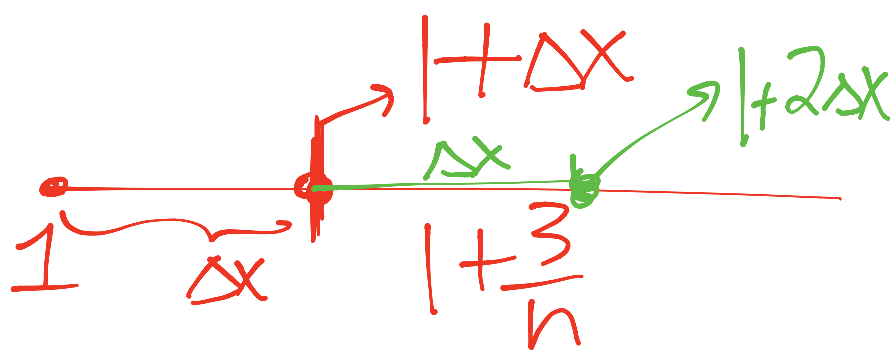


$\text{Area} = \text{base} \cdot \text{ht.}$ $\quad a = 1$

$\Delta x \cdot f(\Delta x)$ $\quad b = 4$

$\Delta x = \frac{b-a}{n} = \frac{3}{n}$

$\underline{x_i} \rightarrow$



$$x_i = 1 + i \cdot \Delta x$$

$$x_i = 1 + i \cdot \frac{3}{n}$$

$$x_i = 1 + \frac{3i}{n}$$

$$\text{Area} = \Delta x \cdot f(x_i)$$

$$= \frac{3}{n}\left(4\left(1+\frac{3i}{n}\right)-2\right)$$

$$= \frac{3}{n}\left(4+\frac{12i}{n}-2\right)$$

$$= \frac{12}{n} + \frac{36i}{n^2} - \frac{6}{n}$$

$$= \frac{6}{n} + \frac{36i}{n^2}$$

area if we use "n" rectangles

$$\sum_{i=1}^{n}\left(\frac{6}{n}+\frac{36i}{n^2}\right)$$

$$\sum_{i=1}^{n}\frac{6}{n}+\sum_{i=1}^{n}\frac{36i}{n^2}$$

$$\frac{6}{n}\boxed{\sum_{i=1}^{n}1}+\frac{36}{n^2}\boxed{\sum_{i=1}^{n}i}$$

use formulas

$$=\frac{6}{n}\cdot n+\frac{36}{n^2}\cdot\left(\frac{n(n+1)}{2}\right)$$

$$=6+\frac{\cancel{36}^{18}}{n^2}\left(\frac{n^2+n}{\cancel{2}}\right)$$

$$=6+\frac{18n^2}{n^2}+\frac{18n}{n^2}$$

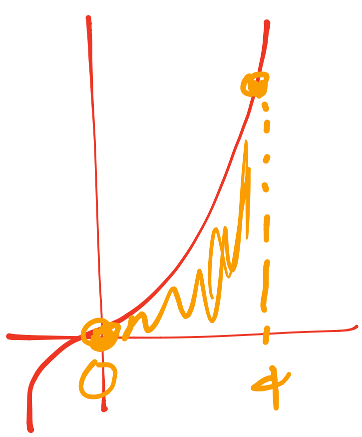
$$=6+18+\frac{18}{n}$$

$$=24+\frac{18}{n}\quad\to 0$$

$$\lim_{n\to\infty}\left(24+\cancel{\frac{18}{n}}\right)=24$$

exact area $=24$.

hw find exact area $f(x)=x^3$, x-axis, $x=0$, $x=4$.



$$\Delta x=\frac{4-0}{n}=\frac{4}{n}$$

$$x_i=0+i\cdot\frac{4}{n}$$

$$x_i=\frac{4i}{n}$$

$$f(x_i)=\left(\frac{4i}{n}\right)^3=\frac{64i^3}{n^3}$$

$$A=\frac{4}{n}\cdot\frac{64i^3}{n^3}=\frac{256i^3}{n^4}$$

$$A = \lim_{n\to\infty} \sum_{i=1}^{n} \frac{256 i^3}{n^4}$$

$$A = \lim_{n\to\infty} \frac{256}{n^4} \cdot \sum_{i=1}^{n} i^3$$

$$A = \lim_{n\to\infty} \frac{\overset{64}{\cancel{256}}}{n^4} \cdot \frac{n^2(n+1)^2}{\cancel{4}}$$

$$A = \lim_{n\to\infty} \frac{64n^2(n^2+2n+1)}{n^4}$$

$$A = \lim_{n\to\infty} \frac{64n^4}{n^4} + \frac{128n^3}{n^4} + \frac{64n^2}{n^4}$$

$$A = \lim_{n\to\infty} \left(64 + \frac{128}{n} + \frac{64}{n^2}\right)$$

$\to 0$ $\to 0$

$$\boxed{A = 64}$$

Use defn of derivative to find $f'(x)$ if $f(x) = x^3$.

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) = \lim_{h \to 0} \frac{(x+h)^3 - x^3}{h}$$

② $f(x) = x^2 + x, \quad x = 2 \ \& \ x = 4$

③ $f(x) = 2x^2 - 3x + 1, \quad x = 1, \quad x = 2$

② $74/3$ ③ $\frac{7}{6}$