Tuesday, March 19

- quiz due (Q2 – interview)
- this week (4.2, 4.3, 4.4)
- TEST #3 Thursday, March 28th

4.2:

REVIEW OF 4.1:

$$\int f(x)\,dx = F(x) + C$$

indefinite integral

$$d(F(x) + C) = f(x) + 0$$

ex: $$\int a \cdot x^n\,dx = \frac{a \cdot x^{n+1}}{n+1} + C$$ (for $n \neq -1$)

$$\int 3x^5\,dx = 3 \cdot \frac{x^6}{6} + C$$
$$= \frac{1}{2}x^6 + C$$ family of curves

check:
$$d\left(\tfrac{1}{2}x^6 + C\right) \overset{??}{=} 3x^5$$
$$= \tfrac{1}{2} \cdot 6 \cdot x^5 + 0$$
$$= 3x^5$$

$$\int a\cdot x^{-1}\cdot dx = a\cdot \boxed{\int \frac{1}{x}\cdot dx}$$
$$= a\cdot \ln|x| + C$$

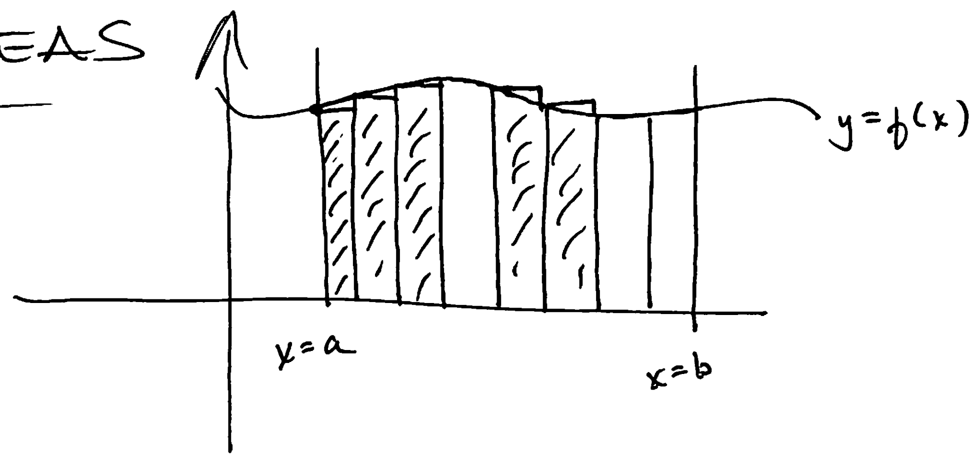
$$\int \underline{14\cdot e^{8x}}\,dx = 14\cdot\frac{1}{8}e^{8x}+C$$

$$\left[\begin{aligned} d(e^{8x}) &= e^{8x}\cdot 8 \\ &= 8\,e^{8x}\end{aligned}\right]$$

check: $d\left(\frac{14}{8}e^{8x}+\underline{C}\right) \overset{??}{=} \underline{14\cdot e^{8x}}$

$$= \frac{14}{\cancel{8}}\,e^{8x}\cdot\cancel{8} + 0$$

4.2: AREAS

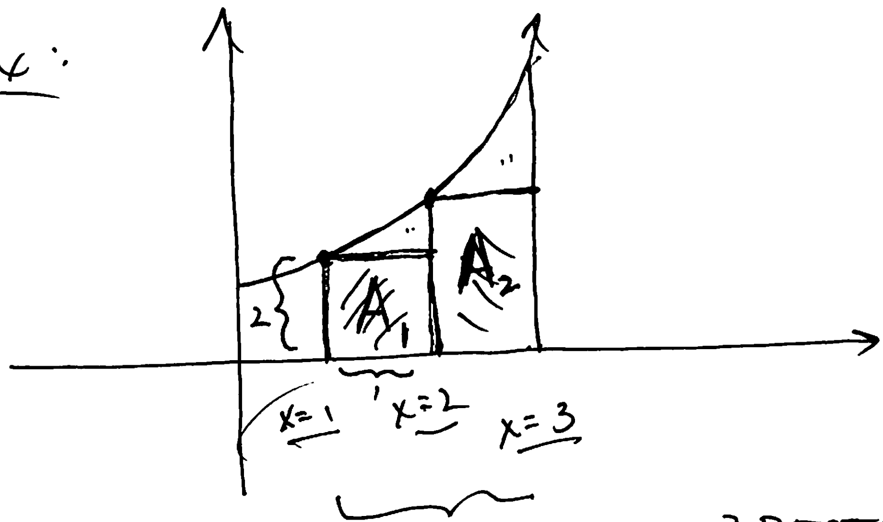


APPROX THE AREA

SUM OF THE AREAS
OF THE
RECTANGLES

(MORE RECTANGLES $\longrightarrow$
HIGHER ACCURACY)

ex:



$f(x) = x^2 + 1$

$A_1 = (2)(1) = 2$

$A_2 = (5)(1) = 5$

2 RECTANGLES
WIDTH OF EACH

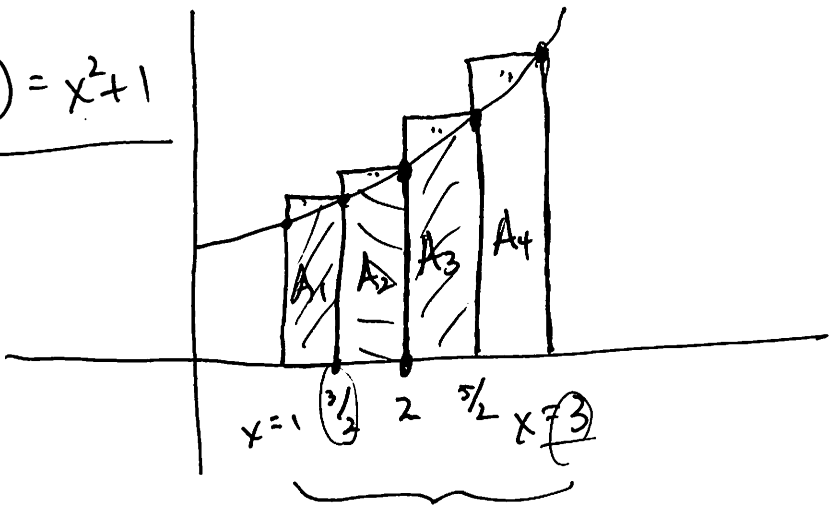
$$= \frac{3-1}{2} = \frac{2}{2} = 1$$

AREA UNDER CURVE $\approx A_1 + A_2$

$\approx 2 + 5$

≈ 7

$f(x) = x^2 + 1$



WIDTH:

$$\frac{3-1}{4} = \frac{2}{4} = \frac{1}{2}$$

$A_1 = \left(\frac{13}{4}\right)\left(\frac{1}{2}\right) = \frac{13}{8}$

$A_2 = (5)\left(\frac{1}{2}\right) = \frac{5}{2}$

$A_3 = \left(\frac{29}{4}\right)\left(\frac{1}{2}\right) = \frac{29}{8}$

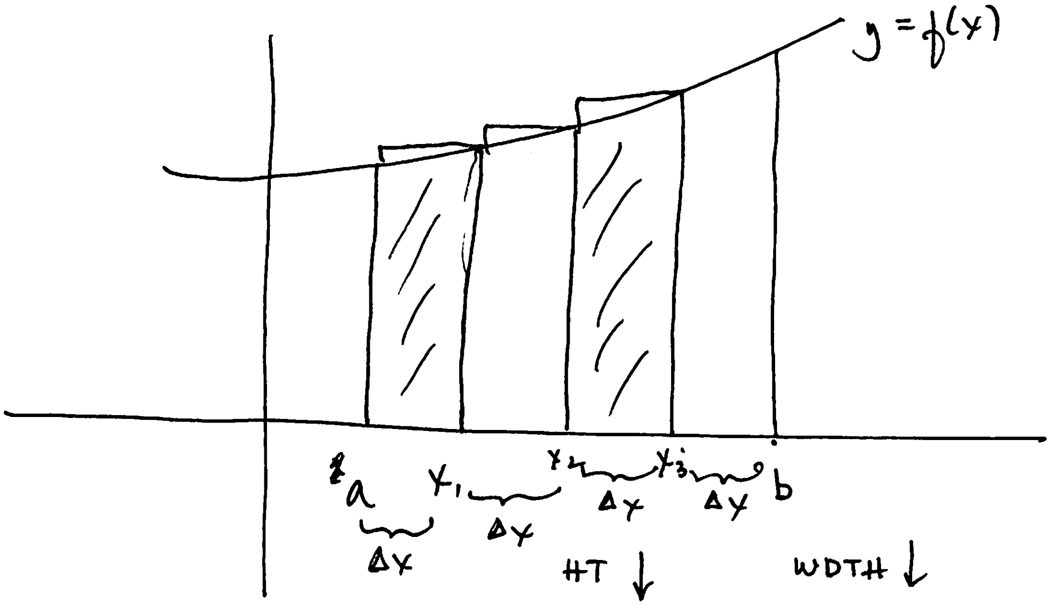
$A_4 = (10)\left(\frac{1}{2}\right) = 5$

AREA UNDER CURVE $\approx A_1 + A_2 + A_3 + A_4$

$\approx \frac{13}{8} + \frac{5}{2} + \frac{29}{8} + 5$

$\approx \frac{13}{8} + \frac{20}{8} + \frac{29}{8} + \frac{40}{8} = \frac{102}{8}$

73
$\frac{29}{2}$



HT ↓ WDTH ↓

$$A_1 = f(x_1) \cdot (\Delta x)$$

$$A_2 = f(x_2) \cdot (\Delta x)$$

$$A_3 = f(x_3) \cdot (\Delta x)$$

$$\vdots$$

$$A_4 = f(x_4) \cdot (\Delta x)$$

$$\text{AREA} \approx \sum_{i=1}^{4} f(x_i) \cdot \Delta x = f(x_1)\cdot\Delta x + f(x_2)\cdot\Delta x + f(x_3)\cdot\Delta x + f(x_4)\cdot\Delta x$$

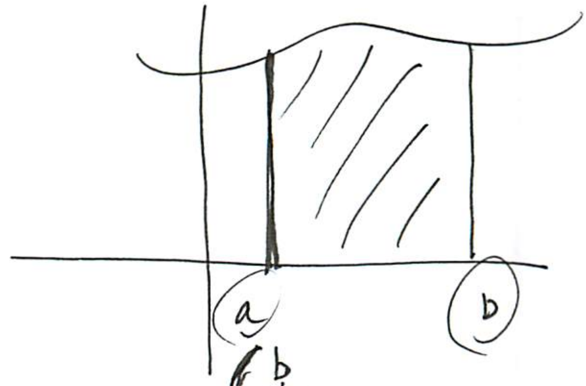
↑ SUMMA

(better approx....)

$$\text{AREA} \approx \sum_{i=1}^{100,000} f(x_i) \cdot \Delta x$$

(better ....)

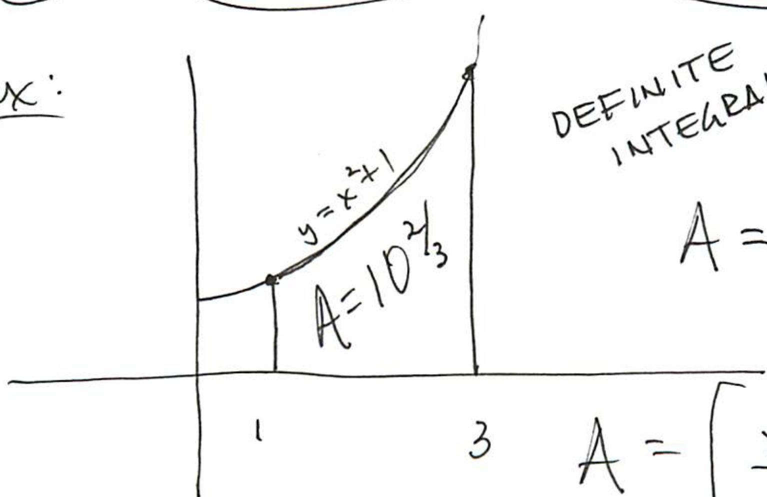
$$AREA = \lim_{n\to\infty} \sum_{i=1}^{n} \underbrace{f(x_i)}_{HT} \cdot \underbrace{\Delta x}_{WDTH}$$



$$A = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i) \cdot \Delta x = \int_a^b f(x) \cdot dx$$

$$= F(x)\Big]_a^b = F(b) - F(a)$$

ex:



DEFINITE INTEGRAL

$A \approx 7$ $\quad$ $A \approx \frac{102}{8}$

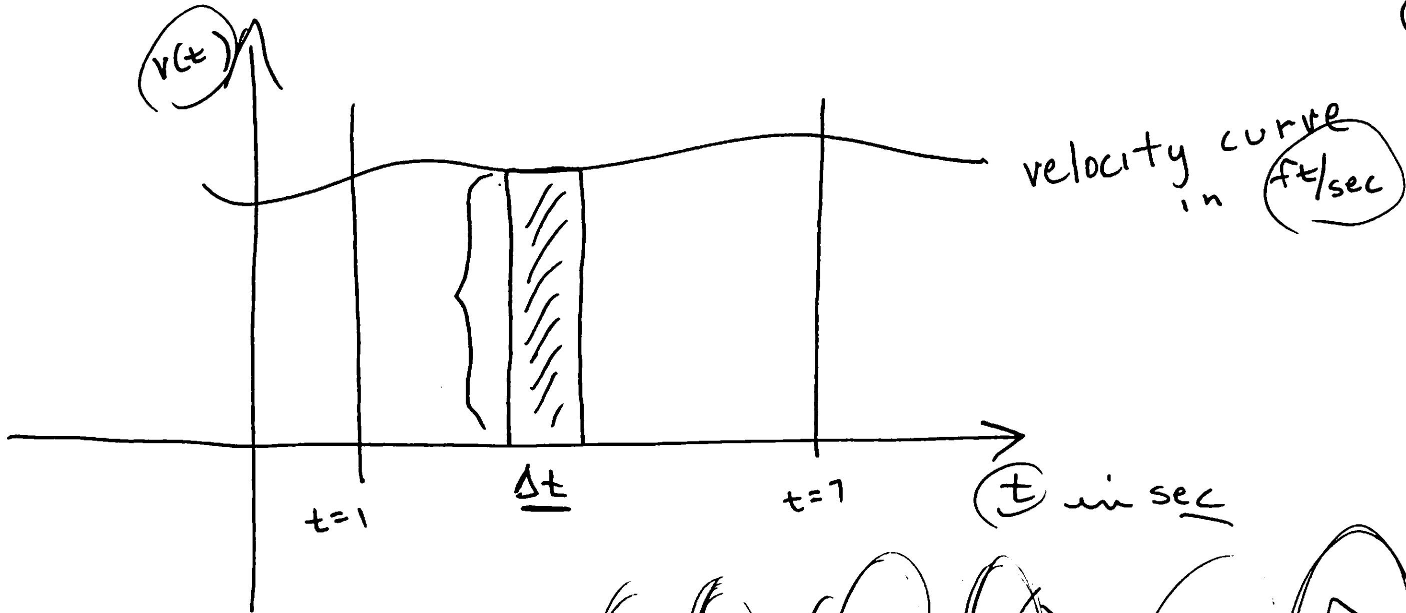
$$A = \int_1^3 (x^2+1) \cdot dx$$

$$A = \left[\frac{x^3}{3} + x + \cancel{C}\right]_1^3$$

$$A = \left(\frac{3^3}{3} + 3 + \cancel{C}\right) - \left(\frac{1^3}{3} + 1 + \cancel{C}\right)$$

$$A = (9 + 3) - \left(\tfrac{1}{3} + 1\right) = 12 - 1\tfrac{1}{3}$$

$$= 10\tfrac{2}{3}$$

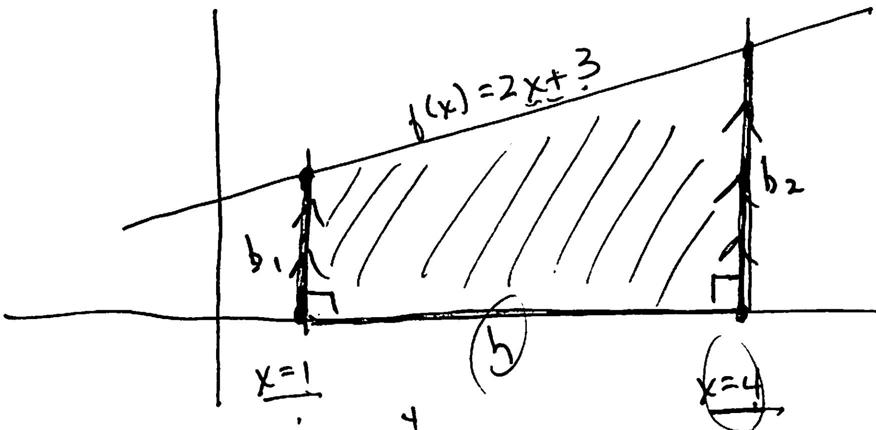


$$A = \left(\sim \frac{ft}{sec}\right)\left(\sim sec\right) = \left(\sim ft\right)$$

$$\int v(t)\,dt = s(t) \qquad s(t) \xrightarrow{\text{DERIV.}} v(t)$$

ANTIDERIV

area under a VEL. curve is DIST.



check:

$A = \frac{1}{2}(b_1+b_2)\cdot h$

$A = \frac{1}{2}(5+11)\cdot 3$

$A = 24$

$$A = \int_1^4 (2x+3)\cdot dx = \left[x^2+3x\right]_1^4$$

$$= \left[4^2+3(4)\right] - \left[1^2+3(1)\right]$$

$$= (28) - (4) = 24$$