MA 121-001

Thursday, November 1

CH 4:

$f'(x) = 3x + 2$ ✓ $\quad f(1) = 5$ ✓ $\quad x = 1,\ y = 5$

find $f(x)$:

ANTI DERIVATIVE (INTEGRAL)

$$f(x) = \int f'(x)\,dx$$

$$f(x) = \int (3x + 2)\,dx$$

indef. integral

$$f(x) = 3 \cdot \frac{x^2}{2} + 2x + C$$

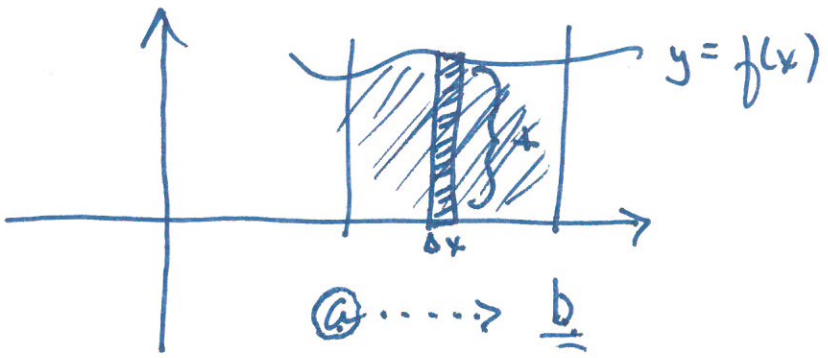
$$5 = \frac{3}{2}(1)^2 + 2(1) + C$$

$$5 = \frac{3}{2} + 2 + C$$

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

$$1\frac{1}{2} = C$$

$$f(x) = \frac{3}{2}x^2 + 2x + 1\frac{1}{2}$$



def. integral:

$$\int_a^b f(x)\cdot dx = F(x)\Big]_a^b = F(b) - F(a)$$

$$= + \text{\_\_\_\_\_}$$

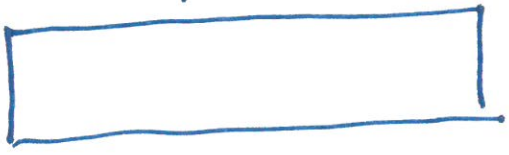
NEG. AREA:

1 chain: 66 ft.

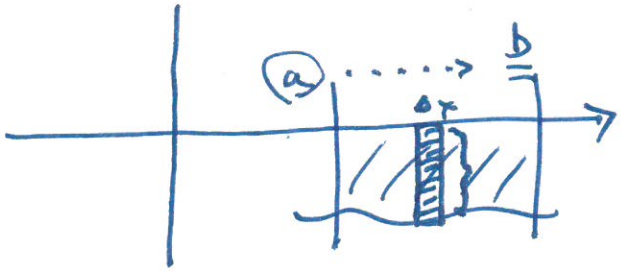
10 sq. chains

$10 = 660$

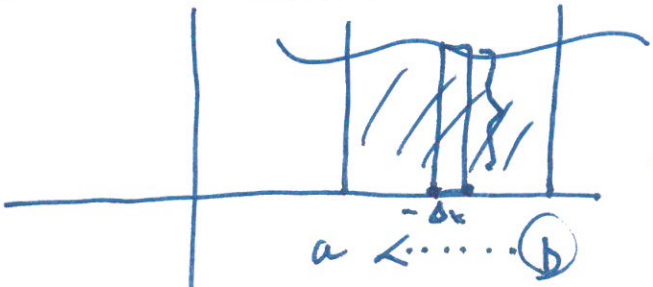
$66 = 1$



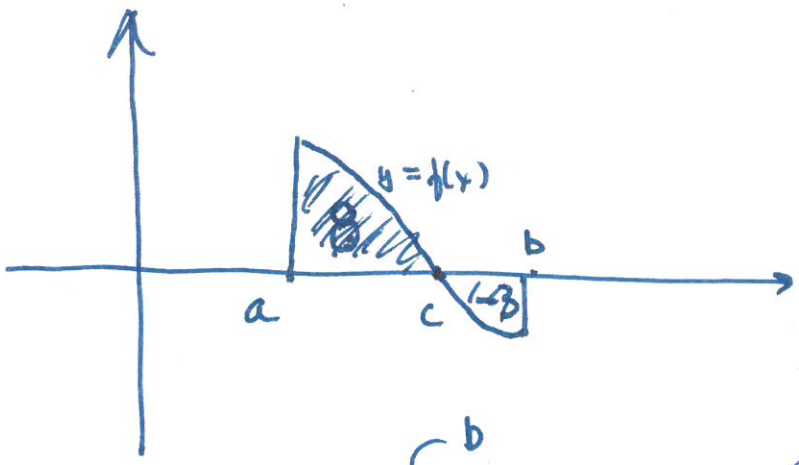
$(660)(66) = 43,560\ ft^2$



AREA is NEG



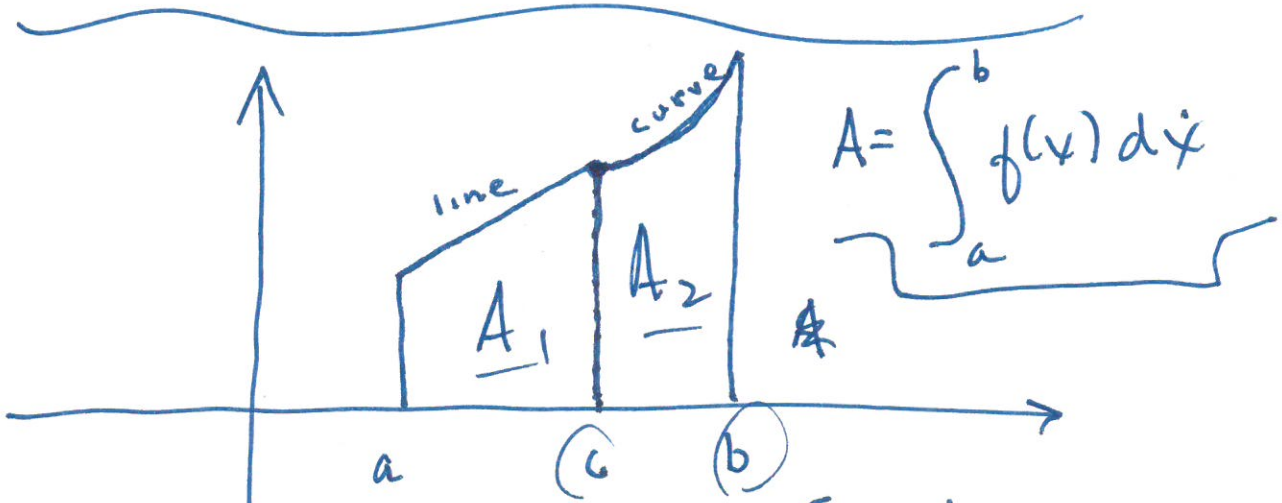
$$\int_b^a f(x)\,dx = \text{NEG}$$



$$\int_a^b f(x)\,dx \neq 5$$

$$\int_a^c f(x)\,dx = +\text{\_\_\_\_}$$

$$\int_c^b f(x)\,dx = -\text{\_\_\_\_}$$



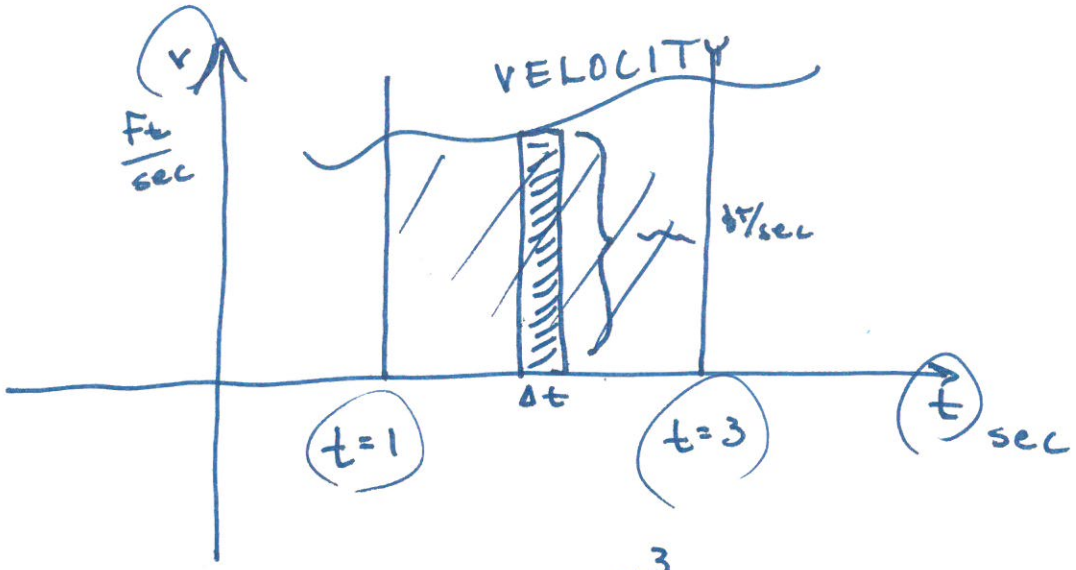
$$A = \int_a^b f(x)\,dx$$

$$A_1 = \int_a^c f(x)\,dx \quad \text{(LINE)}$$

$$+\ A_2 = \int_c^b f(x)\,dx \quad \text{(CURVE)}$$

$$f(x) = \begin{cases} \text{line} \ldots \\ \text{curve} \ldots \end{cases}$$

continuous



$$\left(\sim\!\frac{ft}{sec}\right)\left(\sim\!sec\right)\int_1^3 v(t)\cdot dt = +\sim\!ft$$

DIST ; DIST ; POS

$$= \sim\!ft$$

$$s(t) \xrightarrow{\text{DERIV.}} v(t)$$

$$v(t) \xrightarrow{\text{ANTI DERIV.}} s(t)$$

TEST #3: TUES, NOV 6th

(2.5 ; 3.1 → 3.5 ; 4.1 → 4.3)

2.5: max/min word prob.
(OPTIMIZATION)

→ 3.1: $d(e^x) = e^x$

chain rule: $d(e^{f(x)}) = e^{f(x)} \cdot f'(x)$

→ 3.2: $d(\ln x) = \frac{1}{x}$

chain rule: $d(\ln f(x)) = \frac{1}{f(x)} \cdot f'(x)$

3.3: exp. growth

LOGISTIC: $y = \frac{L}{1+b \cdot e^{kt}}$

$y = y_0 \cdot e^{kt}$ ← know this

3.4: exp. decay

NEWTON'S LAW OF COOLING:

$y = a \cdot e^{kt} + m$ ← temp. of surr. med.

3.5: $d(a^x) = a^x \cdot \ln a$

chain rule: $d(a^{f(x)}) = a^{f(x)} \cdot \ln a \cdot f'(x)$

$d(\log_a x) = \frac{1}{x \cdot \ln a}$

chain rule:

$d(\log_a f(x)) = \frac{1}{f(x) \cdot \ln a} \cdot f'(x)$

4.1: indef. integral → "family of curves"

① $\int a \cdot x^n \cdot dx = a \cdot \frac{x^{n+1}}{n+1} + C$

(for $n \neq -1$)

② $\int a \cdot x^{-1} dx = \int a \cdot \frac{1}{x} dx = a \cdot \ln|x| + C$

③ $\int a \cdot e^{bx} dx = a \cdot \frac{1}{b} \cdot e^{bx} + C$

4.2: areas ... DEF INTEGRAL

4.3:

$$\int_a^b f(x)\,dx = F(x)\Big]_a^b = F(b) - F(a)$$