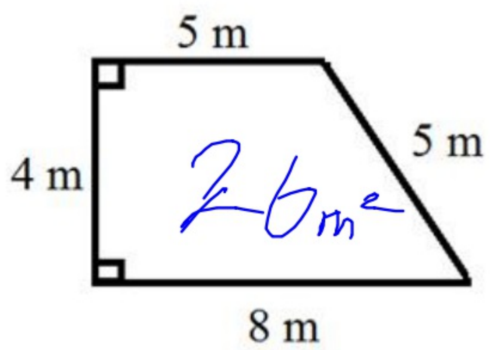
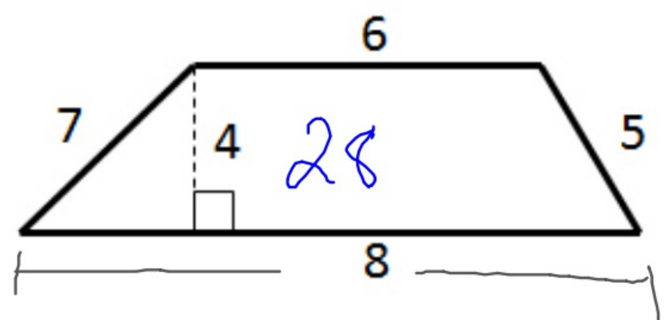
Good afternoon:

Warm up: find the area

$$A = \underbrace{\tfrac{1}{2}(b_1+b_2)}_{(\text{avg. of bases})}h \qquad (\text{avg. of bases}) \cdot h$$





Monday Assess:

Basic antiderivs, U-substitution and Finding C

(old) (p. 301 #47-50) (will do more today)

$$\int \sin\ 2x \cos^3 2x\, dx$$

$$-\frac{1}{2}\int -\cancel{2}\sin 2x \cdot (\cos 2x)^3$$

Need: $-2\sin 2x$

$$-\frac{1}{2}\int -2\sin 2x\,(\cos 2x)^3\,dx$$

$$-\frac{1}{2}\cdot\frac{(\cos 2x)^4}{4} + C \longrightarrow \boxed{-\frac{1}{8}(\cos 2x)^4 + C}$$

$$\frac{a}{b}\cdot\frac{c}{d} = \frac{a\cdot c}{b\cdot d}$$

$$\frac{a}{b}\div\frac{c}{d}$$

$$\frac{a}{b}\cdot\frac{1}{c}$$

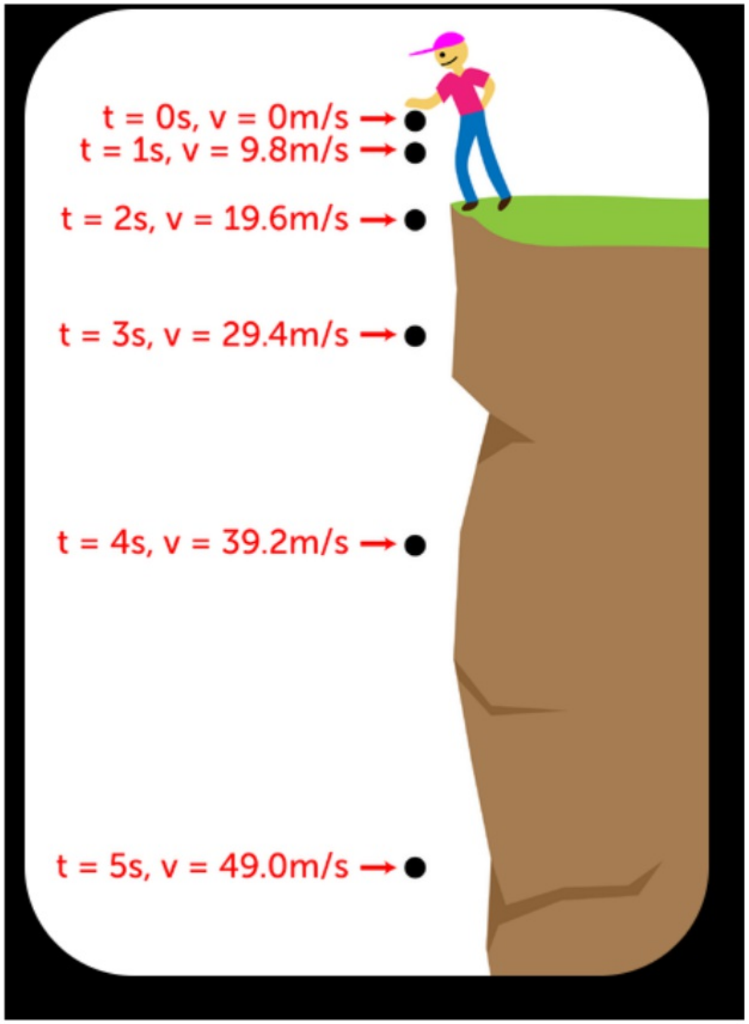
$$\int \frac{(\ln x)^2}{x}\, dx$$

$$\int \frac{(\ln x)^2}{x}\,dx$$

$$\int (\ln x)^2 \cdot \frac{1}{x} \cdot dx$$

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

$$s(t) = -16t^2 + v_o + s_o$$


t = 0s, v = 0m/s
t = 1s, v = 9.8m/s
t = 2s, v = 19.6m/s
t = 3s, v = 29.4m/s
t = 4s, v = 39.2m/s
t = 5s, v = 49.0m/s

Finding C, revisited

$\int 1 \cdot dv = x + c$

Acceleration due to gravity: -32 ft/s

a(t)= - 32

$$\frac{d}{dt}\ \text{p(t)} \quad \int dt$$
$$\text{v(t)}$$
$$\frac{d}{dt}\ \text{a(t)} \quad \int dt$$

$$v'(t) = \frac{dv}{dt} = -32$$

$$\underbrace{\int 1 \cdot dv}_{\text{ok}} = \int -32\, dt$$

$$v = -32t + C \longrightarrow -32t + V_0$$

initial velocity.

at $t = 0$

$$v(0) = -32(0) + C$$

$$\underbrace{V_0 = C}_{\text{ok}}$$

$$\cancel{\frac{dv}{dt}}\ V = -32t + V_0$$

$$\int 5x^2 + 2x + 3 \cdot dx$$

$$\frac{dp}{dt} = -32t + V_0$$

$$\int 1\, dp = \int (\underline{-32t + V_0})\, dt$$

$$P = -32\frac{t^2}{2} + V_0 \cdot t + C$$

at $t=0$, $p(0) = C = P_0$ (initial pos.)

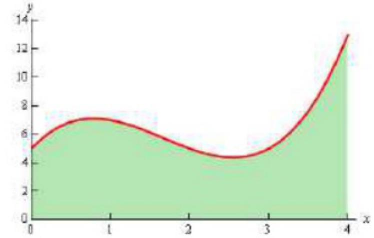
$$\boxed{P(t) = -16t^2 + V_0 \cdot t + P_0}$$

Okay now back to area :)

Riemann Definition of Definite Integral

$$\underbrace{\int_a^b f(x)\,dx}_{\text{Area } \cancel{\text{used}} \text{ under curve.}} = \underbrace{\lim_{n\to\infty}}_{\infty \text{ rectangles}} \underbrace{\sum_{i=1}^{n}}_{\text{adding up } n \text{ rectangle areas}} \underbrace{f(x_i)\,\Delta x}_{\text{Area of 1 rectangle}}, \quad \text{where } \underbrace{\Delta x}_{\text{width of 1 rect.}} = \frac{\overset{\text{end}}{b} - \overset{\text{start}}{a}}{\underbrace{n}_{\text{\# of rec}}}$$

How to approximate definite integrals
Estimate the area under the curve $f(x) = x^3 - 5x^2 + 6x + 5$
On the interval [0,4] using 5 subintervals of equal width.



Write as a definite integral

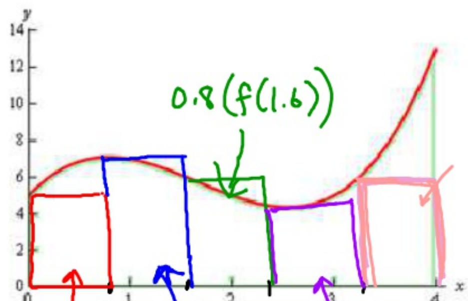
$$\int_0^4 x^3 - 5x^2 + 6x + 5 \, dx$$

Write approximation as a Riemann sum

$$\Delta x = \frac{4-0}{5} = 0.8$$

Left-Rectangle Approximation Method (LRAM)

$0.8(f(1.6))$ $\quad$ $0.8(f(3.2))$



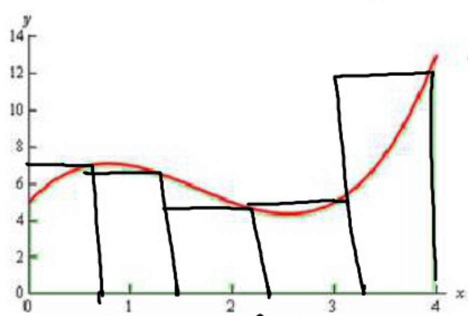
$.8 \quad 1.6 \quad 2.4 \quad 3.2$

$.8(f(0))$ $\quad$ $.8(f(.8))$ $\quad$ $.8(f(2.4))$

$$.8(5 + 7.112 + 5.896 + 4.424 + 5.768) = \boxed{22.56}$$

LRAM.

Right-Rectangle Approximation Method (RRAM)

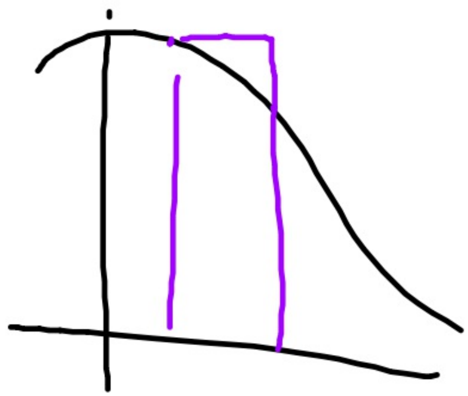


$.8 \quad 1.6 \quad 2.4 \quad 3.2$

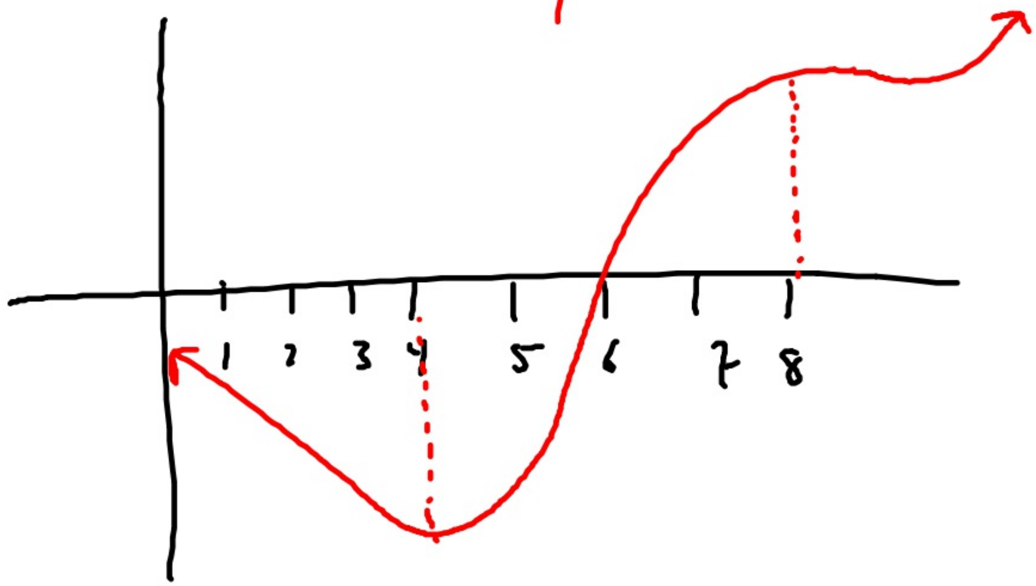
$$.8(7.112 + 5.896 + 4.424 + 5.768 + 13)$$

$$= 28.96$$

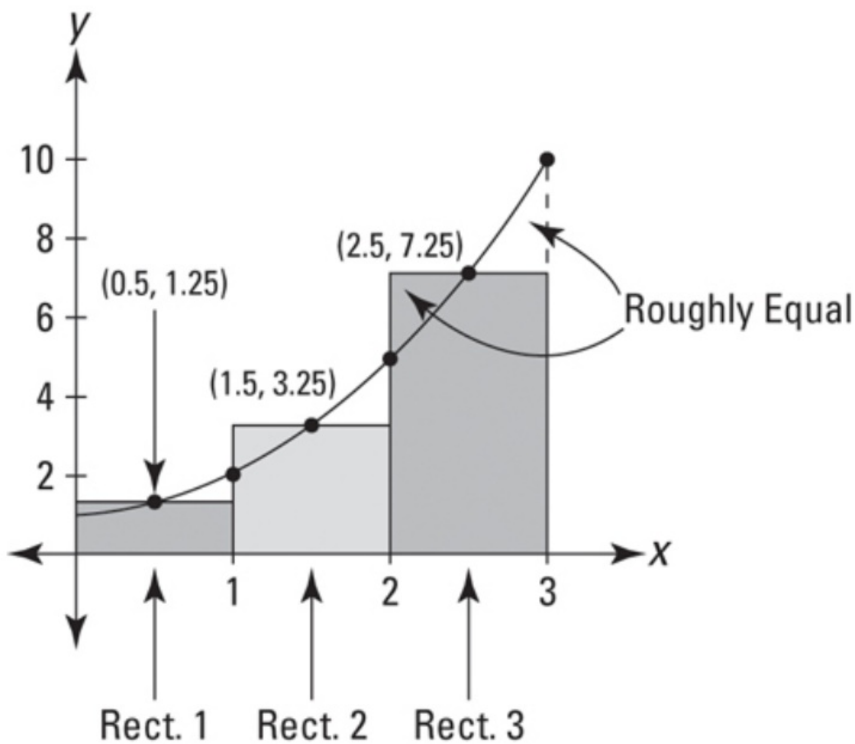
When is an LRAM an overapproximation?



What would the value of $\int_4^8 f(x)\,dx$ be?



A 'better' way?



y
10
8
6
4
2
(0.5, 1.25)
(1.5, 3.25)
(2.5, 7.25)
Roughly Equal
x
1
2
3
Rect. 1
Rect. 2
Rect. 3

P. 263 #25-30

AND

take notes on video to be posted at mcalc.weebly.com