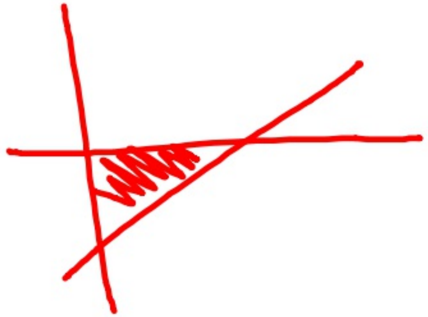
Good afternoon: check new hw answers

1c. 9.978

"2010AB4"

2 A (should read 4th quadrant)

4 C



5c $\text{Volume} = \int_0^6 \frac{3}{16} y^4 \, dy$

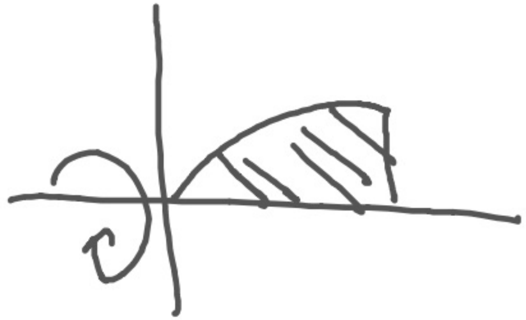
(notice: "$\perp$ to y-axis")

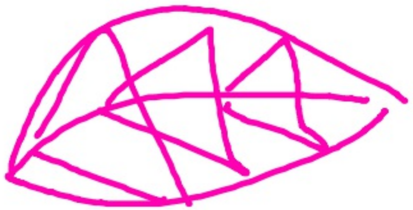
6c 26.266

visibly random grouping

What we've learned so far:

- disc method, dx
- disc method, dy
- washer method, x and y axis
- washer method, any horiz/vert line
- cross section volume: square, eq triangle, isos triangle, semicircle, rectangle





What's on Thursday's test?

Brief detour back to average value

formula: $$f_{avg} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

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

$$b-a = \Delta x \cdot n$$

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

$$\frac{\Delta x}{b-a} = \frac{1}{n}$$

$$\frac{1}{b-a}\cdot \Delta x = \frac{1}{n}$$

$$\frac{\sum_{i=1}^{n} x_i}{n} \rightarrow \frac{1}{n}\sum x_i$$

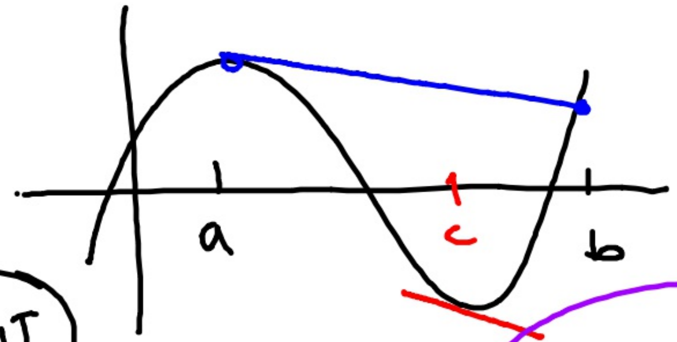
$$\frac{1}{b-a}\cdot \Delta x \sum_{i=1}^{n} x_i$$

$$\frac{1}{b-a}\sum x_i \Delta x$$

$$\int$$

Why does it work: (mvt)

(ftc2)



MVT

$$f'(c) = \frac{f(b)-f(a)}{b-a}$$

$$\int_1^3 2x\,dx \qquad x^2\Big]_1^3$$

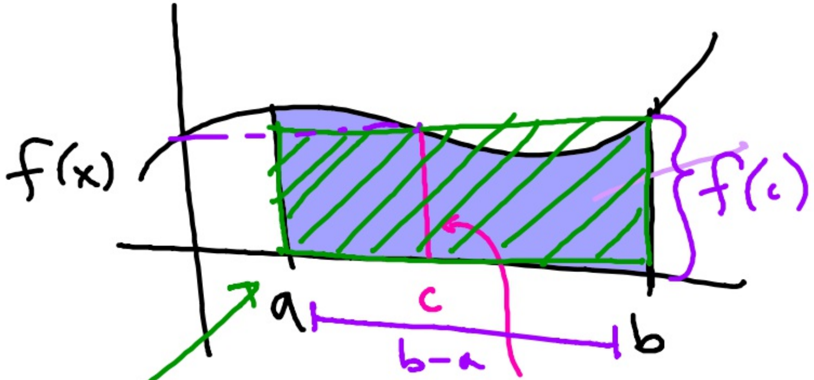
FTC 2

$$f'(c) = \frac{\int_a^b f'(x)\,dx}{b-a}$$

$$f'(c) = \frac{1}{b-a}\int_a^b f'(x)\,dx$$

MVT for integrals.

Geometric interpretation:



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

rect area
=
curved area

avg value of f(x)
between a and b.

base × height

$$(b-a)\cdot(f(c)) = \int_a^b f(x)\,dx$$

$$\underline{\underline{f(c)}} = \frac{1}{b-a}\int_a^b f(x)\,dx$$

Example: Assume that in a certain city the temperature (in °F) t hours after 9 A.M. is represented by the function

$$T(t) = 50 + 14\sin\frac{\pi t}{12}.$$

$\frac{\pi}{12} \cdot t$

Find the average temperature in that city during the period from 9 A.M. to 9 P.M.

$t=0$ $t=12$

$a = 0$
$b = 12$

$$T_{avg} = \frac{1}{12-0}\int_0^{12} 50 + 14\sin\left(\frac{\pi}{12}\right.$$

math-9

avg temp. $\leftarrow \frac{1}{12} \cdot (\ \# \ )$

Find the average value of $f(x) = \dfrac{4(x^2+1)}{x^2}$ over the interval [1,3]

$$f_{avg} = \frac{1}{2}\int_1^3 \frac{4(x^2+1)}{x^2}\,dx$$

$$\frac{1}{2}\int_1^3 \frac{4x^2+4}{x^2}\,dx$$

$$\frac{\cancel{4x^2}}{\cancel{x^2}} + \frac{4}{x^2}$$

$$\frac{1}{2}\int_1^3 4+4x^{-2}\,dx$$

$$\frac{1}{2}\left[4x - \frac{4}{x}\right]_1^3$$

$$\frac{1}{2}\left[\left(12 - \frac{4}{3}\right) - \cancel{(4-4)}\right]$$

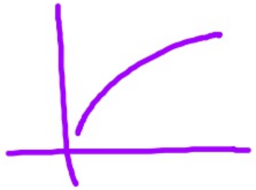
$$\frac{36}{3} - \frac{4}{3}$$

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

$$\frac{1}{2}\left(\frac{32}{3}\right) \rightarrow \frac{32}{6} \rightarrow \frac{16}{3}$$

2

t (minutes)	0	1	2	3	4	5	6
$C(t)$ (ounces)	0	5.3	8.8	11.2	12.8	13.8	14.5



3. Hot water is dripping through a coffeemaker, filling a large cup with coffee. The amount of coffee in the cup at time t, $0 \le t \le 6$, is given by a differentiable function C, where t is measured in minutes. Selected values of $C(t)$, measured in ounces, are given in the table above.

(a) Use the data in the table to approximate $C'(3.5)$. Show the computations that lead to your answer, and indicate units of measure.

(b) Is there a time t, $2 \le t \le 4$, at which $C'(t) = 2$? Justify your answer.

(c) Use a midpoint sum with three subintervals of equal length indicated by the data in the table to approximate the value of $\frac{1}{6}\int_0^6 C(t)\,dt$. Using correct units, explain the meaning of $\boxed{\frac{1}{6}\int_0^6 C(t)\,dt}$ in the context of the problem.

$(5.3)(2) + (11.2)(2) + (13.8)(2)$

$= \dfrac{\text{\_\_\_\_\_\_ } \cancel{\text{oz}\cdot\text{min}}}{6\ \cancel{\text{min}}} = ☺\ \text{oz.}$

☺ is the avg. # of ounces in the cup from time $t=0$ to $t=6$.

More volume practice

check answers by googling "year AP calculus frq scoring"

Key problems:

2009 AB4: b, c

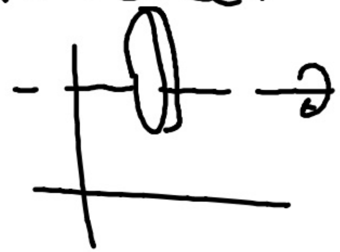
2014 AB2: a, b

2013 AB5: b, c

2004 AB2: b, c*

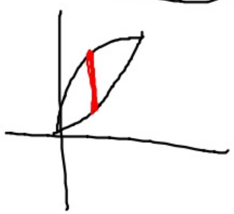
Practice assessment

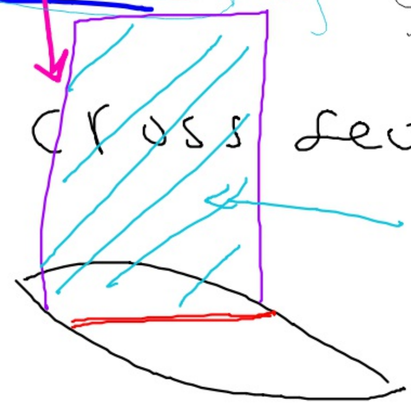
I-A5a: disk, washer (dx)



I-A5b: Washer method, (dy)

I-A5c: cross sect. volume





I-A7: avg value