01/06/20

INTRODUCTION

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-FROM COLUMBIA

3 EXAMS (INCLUDING FINAL)

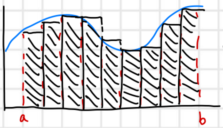
2 MIDTERMS (50%)
1 FINAL (25%)
QUIZES (25%)

QUIZES ARE ON THURSDAYS
NO QUIZ THE FIRST WEEK
NO GRADING CURVES
2 LOWEST QUIZES ARE DROPPED

REVIEW:

CONTINUOUS = NO HOLES

DEFINITION OF DEFINITE INTEGRAL: LET f BE A CONTINUOUS FUNCTION ON A CLOSED INTERVAL [A,B]. DIVIDE [A,B] INTO N EQUAL PARTS OF WIDTH $\Delta x = \frac{b-a}{n}$. LET $x_0, x_1, \ldots, x_n$ BE THE ENDPOINTS OF THIS SUBDIVISION.



THE DEFINITE INTEGRAL OF f FROM $x=a$ TO $x=b$ IS DENOTED BY $\int_a^b f(x)dx$ & CAN BE DEFINED AS:

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

MORE RECTANGLES: CLOSER APROX
WE CANNOT FIND INFINITE BUT WE CAN APROXIMATE IT.

THE EVALUATION THEORY: LET f BE A CONT. FUNCTION ON [A,B] AND LET F BE ANY ANTIDERIVATIVE OF f then:

$$\int_a^b f(x)dx = F(b) - F(a)$$

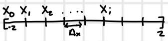
EXAMPLES:

1) USE THE RIGHT ENDPOINT DEF OF DEFINITE INTEGRAL TO WRITE THE INTEGRAL $\int_{-2}^{2}(2x+2)dx$ AS THE LIMIT OF A SUM

$$\Delta x = \frac{b-a}{n} \to \Delta x = \frac{2-(-2)}{n} \to \Delta x = 4/n$$

$$f(x) = 2x+2 \to f(x_i) = 2x_i + 2$$

$$x_i = -2 + i\Delta x \to -2 + i\left(\tfrac{4}{n}\right) \to -2 + \tfrac{4i}{n}$$



$x_0 = -2 = a$
$x_1 = -2 + \Delta x$
$x_2 = -2 + 2\Delta x$
$x_i = -2 + i\Delta x$

$$\int_{-2}^{2}(2x+2)dx = \lim_{n\to\infty}\sum_{i=1}^{n}(2(x_i)+2)\frac{4}{n} \to \lim_{n\to\infty}\sum_{i=1}^{n}\left(2\left(-2+\frac{4i}{n}\right)+2\right)\frac{4}{n}$$

$$\to \lim_{n\to\infty}\sum_{i=1}^{n}\left(-2+\frac{8i}{n}\right)\frac{4}{n} \to \boxed{\lim_{n\to\infty}\sum_{i=1}^{n}\left(\frac{32i}{n^2}-\frac{8}{n}\right)}$$

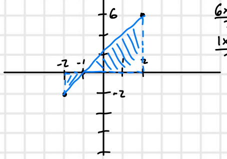
2) USE EVALUATION THEORY OF PREVIOUS EXAMPLE:

$$\int_{-2}^{2}(2x+2)dx = F(2) - F(-2)$$

$F = x^2 + 2x$

$F(2) = 2^2 + 2(2) \to 8$
$F(-2) = -2^2 + 2(-2) \to 0$
$8 - 0 = \boxed{8}$

3) GEOMETRIC WAY:



FIND AREA OF TRIANGLES

$\frac{6\times 3}{2} = 9$

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

$9 - 1 = \boxed{8}$