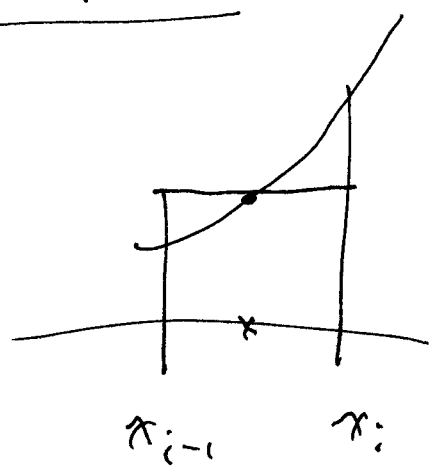


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①

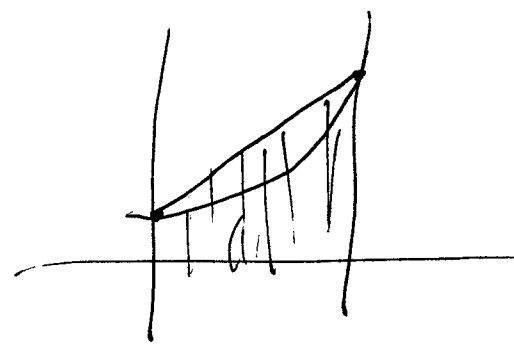
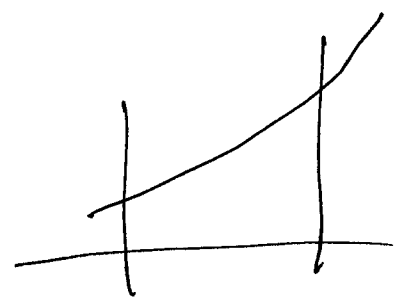
Midpoint



$$\Delta x \cdot f\left(\frac{x_{i-1} + x_i}{2}\right)$$

midpoint

Trapezoid



Area of trapezoid

$$\Delta x \cdot \frac{f(x_{i-1}) + f(x_i)}{2}$$

EXAM

Fri Oct 19

Through 3.2 in dif eq.

No 7.5 from calc. on exam

Error = $\int_a^b f(x) dx$ - approximation

Always
~~Usually~~ Error $\rightarrow 0$ as $N \rightarrow \infty$.

If Error goes as $\frac{C}{N^p}$

we say the method has
order p .

Example

$$\int_1^2 (x - 2x^3) \ln x \, dx$$
$$= \frac{9}{8} - 6 \ln 2$$

LEFT $p=1$ RIGHT $p=1$

$$N = 10, 20, 40, 80$$

$$\frac{C}{N} = \frac{C}{10}, \frac{C}{20}, \frac{C}{40}, \frac{C}{80}$$

If $p=2$

(0/12)
③

$N = 10, 20, 40$

$$\text{err} = \frac{C}{(10)^2}, \frac{C}{(20)^2}, \frac{C}{(40)^2}$$

error goes down by
factor of 4 when we
double N .

Midpoint : $p=2$



Simpson

$$p = 4$$

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④

$$\frac{1}{N^4}$$

Bounds



f decreasing

LEFT is over estimate
RIGHT is under

f increasing

LEFT is under
RIGHT is over

f concave up

TRAP is ~~over~~ over

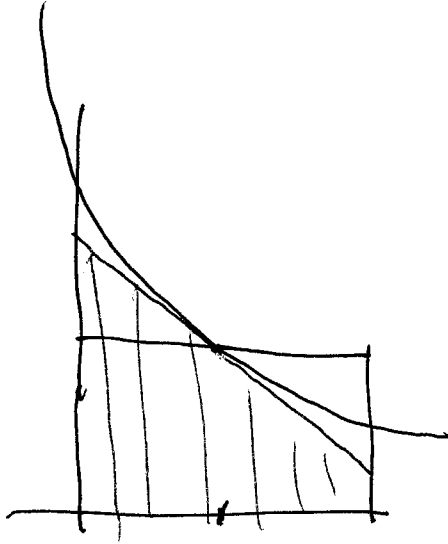
con cave down

TRAP is under

Midpoint

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⑤

f concave up



Red area
= midpoint

f concave up mid is under
concave down over