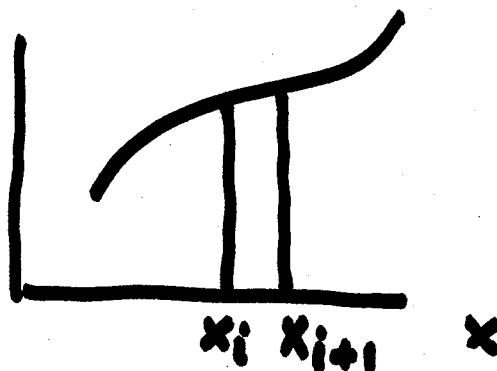


EGM 5346

3/31/99

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



rectangular approx.
trapezoidal rule
Simpson's rule

$$I_{\text{actual}} = I_{\text{num } \Delta x} + C \Delta x^2$$

$$I_{\text{actual}} = I_{\text{num } 2\Delta x} + C (2\Delta x)^2$$

$$\frac{I_{\text{num } \Delta x} - I_{\text{num } 2\Delta x}}{3} = C \Delta x^2$$

RICHARDSON'S EXTRAPOLATION TO THE LIMIT

$$I_{\text{actual}} = I_{\text{num } \Delta x} + \frac{I_{\text{num } \Delta x} - I_{\text{num } 2\Delta x}}{3}$$

$$I_{\text{actual}} = I_{\text{num } \Delta x/2} + C (\Delta x/2)^2$$

$$\lim_{\Delta x \rightarrow 0} \frac{I_{\text{num } 2\Delta x} - I_{\text{num } \Delta x}}{I_{\text{num } \Delta x} - I_{\text{num } \Delta x/2}} \Rightarrow 4 = 2^2$$

FOR SIMPSON'S RULE

$$I_{\text{actual}} = I_{\text{num } \Delta x} + C \Delta x^4$$

$$I_{\text{actual}} = I_{\text{num } \Delta x} + \frac{I_{\text{num } \Delta x} - I_{\text{num } 2\Delta x}}{\frac{15}{2^p - 1}} \quad p=4$$

$$\lim_{\Delta x \rightarrow 0} \frac{I_{\text{num } 2\Delta x} - I_{\text{num } 4\Delta x}}{I_{\text{num } \Delta x} - I_{\text{num } \Delta x/2}} \Rightarrow 2^p = 16 \text{ FOR SIMPSON}$$

ROMBERG INTEGRATION

$\Delta x/2$	$I_{\text{num } \Delta x/2}$	<u>①</u>	
Δx	$I_{\text{num } \Delta x}$		<u>②</u>
$2\Delta x$	$I_{\text{num } 2\Delta x}$		

~~$$f(x) = I_{\text{num } \Delta x/2} + ①(x - \frac{\Delta x}{2}) + ②(x - \frac{\Delta x}{2})(x - \Delta x)$$~~

~~$$f(x) = I_{\text{num } \Delta x/2} - ① \frac{\Delta x}{2} + ② \frac{\Delta x^2}{2}$$~~