

$$k = \frac{b-a}{n} \quad x_i = a + ik$$

Área

Aplicar la regla de Simpson compuesta a una integral de la forma

$$\int_a^b \int_{c(x)}^{d(x)} f(x, y) dy dx$$

y realizar el programa

$$\int_{c(x)}^{d(x)} f(x, y) dy \approx \frac{h}{3} \left[f(x, c(x)) + 2 \sum_{j=1}^{m/2-1} f(x, y_{2j}) + 4 \sum_{j=1}^{m/2} f(x, y_{2j-1}) + f(x, d(x)) \right]$$

$$h(x) = \frac{d(x) - c(x)}{m} \quad y \quad y_j = c(x) + j h(x)$$

$$\int_a^b f(x) dx \approx \frac{K}{3} \left[F(a) + 2 \sum_{i=1}^{n/2-1} F(x_{2i}) + 4 \sum_{i=1}^{n/2} F(x_{2i-1}) + F(b) \right]$$

$$\Rightarrow \int_a^b \int_{c(x)}^{d(x)} f(x, y) dx dy \approx$$

$$\frac{K}{3} \left[\frac{h(a)}{3} \left[f(a, c(a)) + 2 \sum_{j=1}^{m/2-1} f(a, c(a) + 2j h(a)) + 4 \sum_{j=1}^{m/2} f(a, c(a) + (2j-1) h(a)) \right. \right.$$

$$\left. + f(a, d(a)) \right] + 2 \sum_{i=1}^{n/2-1} \frac{h(a+2ik)}{3} \left[f(a+2ik, c(a+2ik)) \right.$$

$$\left. + 2 \sum_{j=1}^{m/2-1} f(a+2ik, c(a+2ik) + 2j h(a+2ik)) \right.$$

$$\left. + 4 \sum_{j=1}^{m/2} f(a+2ik, c(a+2ik) + (2j-1) h(a+2ik)) + f(a+2ik, d(a+2ik)) \right]$$

$$+ 4 \sum_{i=1}^{n/2} \frac{h(a+(2i-1)K)}{3} \left[f(a+(2i-1)K, c(a+(2i-1)K)) \right.$$

$$\left. + 2 \sum_{j=1}^{m/2-1} f(a+(2i-1)K, c(a+(2i-1)K) + 2j h(a+(2i-1)K)) \right.$$

$$\left. + 4 \sum_{j=1}^{m/2} f(a+(2i-1)K, c(a+(2i-1)K) + (2j-1) h(a+(2i-1)K)) \right.$$

$$\left. + f(a+(2i-1)K, d(a+(2i-1)K)) \right]$$

$$+ \frac{h(b)}{3} \left[f(b, c(b)) + 2 \sum_{j=1}^{m/2-1} f(b, c(b) + 2j h(b)) + 4 \sum_{j=1}^{m/2} f(b, c(b) + (2j-1) h(b)) \right.$$

$$\left. + f(b, d(b)) \right]$$

C:\Users\PACO\Desktop\karen\MétodosNuméricos>python MetodoEuler.txt
Método de euler

Ingrese el intervalo

a= 0

b= 1

Ingrese n entero= 10

Ingrese la función f(t,y)= 2*t-y

Ingrese el valor de la condición inicial y(0)= -1

y(ti+1)= -0.9

y(ti+1)= -0.79

y(ti+1)= -0.671

y(ti+1)= -0.5439

y(ti+1)= -0.40951000000000004

y(ti+1)= -0.268559

y(ti+1)= -0.12170309999999998

y(ti+1)= 0.030467210000000005

y(ti+1)= 0.187420489000000005

y(ti+1)= 0.348678440100000004

1412810
879625
16132744
4048139
04587239

Resolver de manera analítica

$$y'(t) + y(t) = 2t \quad e^{\int dt} = e^t$$

$$e^t (y'(t) + y(t)) = 2t e^t$$

$$d(e^t y(t)) = 2t e^t \Rightarrow e^t y(t) = \int 2t e^t dt \quad u = t, \quad du = dt$$

$$\Rightarrow e^t y(t) = 2(t e^t - \int e^t dt)$$

$$\Rightarrow e^t y(t) = 2t e^t - 2e^t \Rightarrow y(t) = 2(t - 1)$$

Aplicar el método de euler de orden 4 con N=10 al PVI

$$y' = y - t^2 + 1 \quad 0 \leq t \leq 2, \quad y(0) = 0.5$$

$$w_0 = \alpha$$

$$w_{i+1} = w_i + h T^4(t_i, w_i)$$

$$T^4(t_i, w_i) = f(t_i, w_i) + \frac{h}{2} f'(t_i, w_i) + \frac{h^2}{6} f''(t_i, w_i) + \frac{h^3}{24} f'''(t_i, w_i)$$

$$f(t_i, w_i) = y - t^2 + 1 = w_i - t_i^2 + 1$$

$$f'(t_i, w_i) = y' - 2t_i = y - t^2 + 1 - 2t_i = w_i - t_i^2 - 2t_i + 1$$

$$f''(t_i, w_i) = y'' - 2 = y(t_i) - t_i^2 - 2t_i = w_i - t_i^2 - 2t_i - 1$$

$$f'''(t_i, w_i) = y''' - 2 = w_i - t_i^2 - 2t_i - 1$$

$$w_{i+1} = w_i + h \left(w_i - t_i^2 + 1 + \frac{h}{2} (w_i - t_i^2 - 2t_i + 1) + \frac{h^2}{6} (w_i - t_i^2 - 2t_i - 1) + \frac{h^3}{24} (w_i - t_i^2 - 2t_i - 1) \right)$$

$$w_{i+1} = w_i + h \left(w_i - t_i^2 + 1 \right) \left(1 + \frac{h}{2} \right) - h t_i + (w_i - t_i^2 - 2t_i - 1) \left(\frac{h^2}{6} \right) \left(1 + \frac{h}{4} \right)$$

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Símbolo del sistema

C:\Users\PACO\Desktop\karen\MétodosNuméricos>python MetodoEuler2.txt
Método de euler orden 2

Ingrese el intervalo
a=0
b=2

Ingrese n entero n=10

Ingrese el valor de la condición inicial y(0)= 0.5
y(ti+1)= 0.8300000000000001
y(ti+1)= 1.2158000000000002
y(ti+1)= 1.6520760000000003
y(ti+1)= 2.1323327200000004
y(ti+1)= 2.6486459184000006
y(ti+1)= 3.1913480204480007
y(ti+1)= 3.748644584946561
y(ti+1)= 4.306146393634805
y(ti+1)= 4.846298600234462
y(ti+1)= 5.3476842922860435
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Símbolo del sistema

C:\Users\PACO\Desktop\karen\MétodosNuméricos>python MetodoEuler4.txt
Método de euler orden 4

Ingrese el intervalo
a=0
b=2

Ingrese n entero n=10

Ingrese el valor de la condición inicial y(0)= 0.5
y(ti+1)= 0.8321000000000001
y(ti+1)= 1.22031094
y(ti+1)= 1.659343782116
y(ti+1)= 2.1427384954764825
y(ti+1)= 2.662604798374976
y(ti+1)= 3.2093055007351956
y(ti+1)= 3.771069738597968
y(ti+1)= 4.333520578723558
y(ti+1)= 4.879098034852953
y(ti+1)= 5.386354339769397
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