Runge – Kutta de 4to. Orden

Utiliza múltiples estimaciones de la pendiente y así se obtiene un promedio de la misma en el intervalo más exacto.

En este caso k representa la pendiente.

Método Runge – Kutta de 4to. Orden por 1/3 de Simpson.

$k_1 = h\ f\ (y_n,\ t_n)$
$k_2 = h\ f\ (y_n + k_1/2,\ t_n + h/2)$
$k_3 = h\ f\ (y_n + k_2/2,\ t_n + h/2)$
$k_4 = h\ f\ (y_n + k_3,\ t_n + h)$
$y_{n+1} = y_n + 1/6\ (k_1 + 2k_2 + 2k_3 + k_4)$

Ejemplo $y' - 5yt + 1 = 0$ $\qquad y_0 = 2 \qquad h = 0.2$

Despejar: y'

$\boxed{y' = 5yt - 1}$ $\qquad t_0 = 0$

$k_1 = h\ f\ (y_n,\ t_n)$

$k_1 = 0.2\left[5\ (2)(0) - 1\right]$

$\boxed{k_1 = -\ 0.2}$

$k_2 = h\ f\ (y_n + k_1/2,\ t_n + h/2)$

$k_2 = (0.2)\left\{\left[5\left[2 + (-0.2/2)\right](0 + 0.2/2)\right] - 1\right\}$

$k_2 = (0.2)\left\{\left[5\ (1.9)\ (0.1)\right] - 1\right\}$

$\boxed{k_2 = -0.01}$

$k_3 = h\, f\,(y_n + k_2/2,\ t_n + h/2)$

$k_3 = (0.2)\left\{\left[5\left(2 + (-0.01/2)\right)(0 + 0.2/2)\right] - 1\right\}$

$k_3 = (0.2)\left\{\left[5\,(1.995)\,(0.1)\right] - 1\right\}$

$\boxed{K_3 = -0.0005}$

$\boxed{y' = 5yt - 1}$

$k_4 = h\, f\,(y_n + k_3,\ t_n + h)$

$K_4 = (0.2)\left\{\left[5\left(2 + (-0.0005)\right)(0 + 0.2)\right] - 1\right\}$

$K_4 = (0.2)\left\{\left[5\,(1.9995)\,(0.2)\right] - 1\right\}$

$\boxed{K_4 = 0.1999}$

$y_{n+1} = y_n + 1/6\,(k_1 + 2k_2 + 2k_3 + k_4)$

$y_1 = 2 + 1/6\left\{-0.2 + 2\,(-0.01) + 2\,(-0.0005) + 0.1999\right\}$

$y_1 = 2 + 1/6(-0.0211)$

$y_1 = 2 - 0.003516666$

$\boxed{y_1 = 1.996483333}$

Calcular y_2