Iteraciones de Euler

$$v(0) = g - \frac{c}{m}\left(v(0) + a\left(\frac{v(0)}{v_{max}}\right)^b\right)$$

i	t	$v(t)_E$	$v(t)_{RK2}$	$v(t)_{RK4}$
0	0	0	0	0
1	0.1	0.981	0.972	0.972
2	0.2	1.960	1.926	1.926
3	0.3	2.937	2.863	2.863

$$v(0.1) = 9.81 - \frac{12.5}{68.1}\left(0 + 8.3\left(\frac{0}{46}\right)^{2.2}\right) = 9.81 \text{ m/s}$$

$$v_1 = 0 + (9.81)(0.1) = 0.981$$

$$v(0.2) = 9.81 - \frac{12.5}{68.1}\left(0.1 + 8.3\left(\frac{0.1}{46}\right)^{2.2}\right) = 9.79$$

$$v_2 = 0.981 + (9.79)(0.1) = 1.9601$$

$$v(0.3) = 9.81 - \frac{12.5}{68.1}\left(0.2 + 8.3\left(\frac{0.2}{46}\right)^{2.2}\right) = 9.77$$

$$v_3 = 1.9601 + (9.77)(0.1) = 2.9374$$

Iteraciones con R-K2

$$v(0) = g - \frac{c}{m}\left(v(0) + a\left(\frac{v(0)}{v_{max}}\right)^b\right)$$

$K_1 = F(v_0) = 9.81$

$v_{mid} = y_i + \frac{1}{2} K_1 h$

$= 0 + 1/2 (9.81)(0.1)$

$= 0.4905$

$$K_2 = 9.81 - \frac{12.5}{68.1}\left(0.4905 + 8.3\left(\frac{0.4905}{46}\right)^{2.2}\right)$$

$K_2 = 9.7199$

$$v_1 = 0 + (0.1)(9.7199) = 0.972$$

$K_1 = F(0.972)$

$$K_1 = 9.81 - \frac{12.5}{68.1}\left(0.972 + 8.3\left(\frac{0.972}{46}\right)^{2.2}\right) = 9.6312$$

$v_{mid} = y_i + \frac{1}{2} K_1 h$

$v_{mid} = 0.972 + \frac{1}{2}(9.6312)(0.1)$

$v_{mid} = 1.4535$

$$K_2 = 9.81 - \frac{12.5}{68.1}\left(1.4535 + 8.3\left(\frac{1.4535}{46}\right)^{2.2}\right) = 9.5424$$

$$v_2 = 0.972 + (0.1)(9.5474) = 1.926$$

$K_1(1.926)$

$$K_1 = 9.81 - \frac{12.5}{68.1}\left(1.926 + 8.3\left(\frac{1.926}{46}\right)^{2.2}\right) = 9.4560$$

$$v_{mid} = y_2 + \frac{1}{2}K_1 h$$

$$v_{mid} = 1.926 + \frac{1}{2}(9.4550)(0.1)$$

$$v_{mid} = 2.3987$$

$$K_2 = 9.81 - \frac{12.5}{68.1}\left(2.3987 + 8.3\left(\frac{2.3987}{46}\right)^{2.2}\right) = 9.3674$$

$$v_3 = 1.926 + (0.1)(9.3674) = 2.8627$$

Iteraciones con K_1-K_4

$$v(0) = g - \frac{c}{m}\left(v(0) + a\left(\frac{v_0}{v_{max}}\right)^b\right)$$

$K_1 = F(v(0)) = 9.81$

$v_{mid} = y_i + 1/2\, hK_1 = 0.4905$; $K_2 = 9.7199$

$v_{mid} = y_i + 1/2\, hK_2 = 0.4859$; $K_3 = 9.7207$

$v_{mid} = y_i + K_3 h = 0.9720$; $K_4 = 9.6312$

$$v_1 = 0 + \frac{1}{6}(9.81 + 2(9.7199) + 2(9.7207) + 9.6312)(0.1) = 0.9720$$

$K_1 = F(v_1) = 9.6312$

$v_{mid} = y_1 + 1/2\, hK_1 = 1.4536$; $K_2 = 9.5424$

$v_{mid} = y_1 + 1/2\, hK_2 = 1.4491$; $K_3 = 9.5432$

$v_{mid} = y_1 + K_3 h = 1.9263$; $K_4 = 9.4550$

$$v_2 = 0.9720 + \frac{1}{6}(9.6312 + 2(9.5424) + 2(9.5432) + 9.4550)(0.1)$$

$$v_2 = 1.926$$

$K_2 = F(v_2) = 9.455$

$v_{mid} = y_2 + 1/2 h K_1 = 2.398$; $K_2 = 9.367$

$v_{mid} = y_2 + 1/2 h K_2 = 2.394$; $K_3 = 9.368$

$v_{mid} = y_2 + 1/2 h K_3 = 2.394$; $K_4 = 9.368$

$$v_3 = 1.926 + \frac{1}{6}(9.455 + 2(9.367) + 2(9.368 + 9.368))(0.1)$$

$$v_3 = 2.863$$