Euler Method

$\frac{dy}{dt} = f(t,y) = e^{-t} - y^2 \qquad y(0) = 0 \qquad$ up to 1

$t_0 = 0 \qquad w_0 = y_0 = y(0) = 0$

take $t_f = 1$ to aim to approx. $y(1)$ ($y(t)$ where $t = 1$)

step size $h = 0.5$

times: $t_0 = 0 \qquad t_1 = 0.5$
$t_2 = 1.0$

$w_0 = y(0) = 0$

$f(t_0, w_0) = f(0,0) = e^{-0.0} - 0^2 \simeq \underline{1}$

$w_1 = y(0.5) \approx w_0 + h f(t_0, w_0)$
$= 0 + 0.5 \cdot 1 \simeq \underline{0.5}$

$f(t_1, w_1) = f(0.5, 0.5) = e^{-0.5} - 0.5^2 = \underline{0.357}$

$w_2 = y(1) = w_1 + h f(t_1, w_1)$
$\approx 0.5 + 0.5 \cdot 0.357$
$\approx \underline{0.678}$