Analytical

$$y(t+\Delta t) = y(t) \cdot e^{kt}$$

$$y(t+\Delta t) = 0.02 \cdot e^{-0.002 \cdot 60}$$

$$y(t+\Delta t) = 0.0177384087343$$

Euler or Euler Cauchy

$$y(t+\Delta t) = y(t) + \Delta t \cdot f(y(t), t)$$

$$y(t+\Delta t) = y(t) + \Delta t \cdot ky$$

$$y(t+60) = 0.02 + 60 \cdot -0.002 \cdot \ 0.02$$

$$y(t+60) = 0.0176$$

Heun

$$y(t+\Delta t) = y(t) + \Delta t \cdot \frac{f(y(t), t) + f(y^*(t), t)}{2}$$

$$y(t+\Delta t) = y(t) + \Delta t \cdot \frac{ky + ky^*}{2}$$

$$y(t+60) = 0.02 + 60 \cdot \frac{(-0.002 \cdot 0.02) + (-0.002 \cdot 0.0176)}{2}$$

$$y(t+60) = 0.017744$$

Runge-Kutta

$$k_1 = \Delta t\ ky$$

$$k_2 = \Delta t\ k(y + \frac{1}{2}k_1)$$

$$k_3 = \Delta t\ k(y + \frac{1}{2}k_2)$$

$$k_4 = \Delta t\ k(y + k_3)$$

Gives:

$$k_1 = 60 \cdot -0.002 \cdot 0.02$$

$$k_1 = -0.0024$$

$$k_2 = 60 \cdot -0.002 \cdot (0.02 + \frac{1}{2}(-0.0024))$$

$$k_2 = -0.002256$$

$$k_3 = 60 \cdot\ -0.002 \cdot (0.02 + \frac{1}{2}(-0.002256)$$

$$k_3 = -0.00226464$$

$$k_4 = 60 \cdot -0.002 \cdot (0.02 + (-0.00226464)$$

$$k_4 = -0.0021282432$$

$$y(t + 60) = 0.017738413$$