2/47 $a = -kv^2$,

$$v\,dv = a\,dx\,, \quad \int_{v_0}^{v} \frac{v\,dv}{-kv^2} = \int_0^x dx\,, \quad x = \frac{-1}{k}\ln v\Big]_{v_0}^{v}$$

$$x = \frac{1}{k}\ln v_0/v$$

when $v = v_0/2$, $\quad x = D = \frac{1}{k}\ln 2 = \underline{0.693/k}$

$v = \frac{dx}{dt}$ where $kx = \ln v_0/v$, $\quad v = v_0 e^{-kx}$

so $\quad \frac{dx}{v_0 e^{-kx}} = dt \quad$ or $\quad \int_0^t dt = \frac{1}{v_0}\int_0^x e^{kx}\,dx$

$$t = \frac{1}{v_0}\,\frac{1}{k}\,e^{kx}\Big]_0^x = \frac{1}{kv_0}\left[e^{kx} - 1\right]$$

For $x = D$, $\quad e^{kx} = 2 \quad$ so $\quad t = \frac{1}{kv_0}[2-1]$, $\quad \underline{t = \frac{1}{kv_0}}$