49. $\dfrac{dI}{dt} + \dfrac{R}{L}I = \dfrac{V(t)}{L}, \mu = e^{(R/L)\int dt} = e^{Rt/L}, \dfrac{d}{dt}(e^{Rt/L}I) = \dfrac{V(t)}{L}e^{Rt/L},$

$Ie^{Rt/L} = I(0) + \dfrac{1}{L}\displaystyle\int_0^t V(u)e^{Ru/L}du, I(t) = I(0)e^{-Rt/L} + \dfrac{1}{L}e^{-Rt/L}\displaystyle\int_0^t V(u)e^{Ru/L}du.$

(a) $I(t) = \dfrac{1}{5}e^{-2t}\displaystyle\int_0^t 20e^{2u}du = 2e^{-2t}e^{2u}\Big]_0^t = 2\left(1 - e^{-2t}\right)$ A.

(b) $\displaystyle\lim_{t\to+\infty} I(t) = 2$ A

55. $\dfrac{dv}{dt} = -\dfrac{1}{32}v^2, \dfrac{1}{v^2}dv = -\dfrac{1}{32}dt, -\dfrac{1}{v} = -\dfrac{1}{32}t + C; v = 128$ when $t = 0$ so $-\dfrac{1}{128} = C,$

$-\dfrac{1}{v} = -\dfrac{1}{32}t - \dfrac{1}{128}, v = \dfrac{128}{4t+1}$ cm/s. But $v = \dfrac{dx}{dt}$ so $\dfrac{dx}{dt} = \dfrac{128}{4t+1}, x = 32\ln(4t+1) + C_1;$

$x = 0$ when $t = 0$ so $C_1 = 0, x = 32\ln(4t+1)$ cm.

56. $\dfrac{dv}{dt} = -0.02\sqrt{v}, \dfrac{1}{\sqrt{v}}dv = -0.02dt, 2\sqrt{v} = -0.02t + C; v = 9$ when $t = 0$ so $6 = C,$

$2\sqrt{v} = -0.02t + 6, v = (3 - 0.01t)^2$ cm/s. But $v = \dfrac{dx}{dt}$ so $\dfrac{dx}{dt} = (3 - 0.01t)^2,$

$x = -\dfrac{100}{3}(3 - 0.01t)^3 + C_1; x = 0$ when $t = 0$ so $C_1 = 900, x = 900 - \dfrac{100}{3}(3 - 0.01t)^3$ cm.