7a. $\int \frac{1}{x} dx = \int 3 dt$

$\ln x = 3t + c$

$x = ce^{3t}$

$x(0) = 1 = c$

$x = e^{3t}$

b. $dx = 3tx\,dt$

$\int \frac{1}{x} dx = \int 3t\,dt$

$\ln|x| = \frac{3}{2}t^2 + c$

$x = ce^{\frac{3}{2}t^2}$

$x(0) = 1 = c$

$x = e^{\frac{3}{2}t^2}$

c. $\int \frac{1}{.1x - .003x^2} dx = \int dt \Rightarrow \int \frac{1}{\frac{x}{10} - \frac{3x^2}{1000}} dx = \int \frac{1}{\frac{100x - 3x^2}{1000}} dx$

$= -1000 \int \frac{1}{3x^2 - 100x} dx = -1000 \int \frac{1}{x(3x-100)} dx$

$\frac{A}{x} + \frac{B}{3x-100} = \frac{1}{x(3x-100)}$

$A(3x-100) + Bx = 1 \qquad A = -\frac{1}{100} \quad B = \frac{3}{100}$

$-\frac{1000}{100} \int -\frac{1}{x} + \frac{3}{3x-100} dx = \int dt$

$-10(\ln|3x-100| - \ln|x|) = t + c$

$\ln\left|\frac{3x-100}{x}\right| = -\frac{t}{10} + c$

$\frac{3x-100}{x} = ce^{-\frac{t}{10}} \qquad x(0) = 4 \Rightarrow \frac{12-100}{4} = c = -22$

$x = \frac{100}{22e^{-\frac{t}{10}} + 3}$

d. $x(0) = 400 \Rightarrow \frac{1200-100}{400} = c = 5$

$x = \frac{-100}{5e^{-\frac{t}{10}} - 3}$