

Problem: Compute the solutions simple initial value problem

a) $\frac{dx}{dt} = 3x$ and $x(0) = 1.0$

$$\frac{1}{3x} dx = dt$$

$$\frac{\ln(3x)}{3} = t + C, \frac{\ln|3|}{3} = C$$

$$\boxed{\ln(3x)/3 = t + \frac{\ln|3|}{3}}$$

b) $\frac{dx}{dt} = 3xt$ and $x(0) = 1.0$

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

$$\frac{\ln(3x)}{3} = \frac{t^2}{2} + C$$

$$\boxed{\frac{\ln(3x)}{3} = \frac{t^2}{2} + \frac{\ln(3)}{3}}$$

c, d) $\frac{dx}{dt} = 0.1x - 0.003x^2$ and $x(0) = 4,400$

$$\frac{1}{0.1x - 0.003x^2} dx = dt$$

$$10 \ln x - 10 \ln(-0.1 - 0.003x) = t + C$$

$$10 \ln(4) - 10 \ln(-0.1 - 0.003(4)) = C$$

$$10 \ln(400) - 10 \ln(-0.1 - 0.003(400)) = C$$