

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e \tag{1}$$

$$\frac{dx}{dt} = rx \iff x(t) = Ce^{rt} \tag{2}$$

$$x(t) = x_0 e^{pt} = x_0 \lim_{n \rightarrow \infty} \left(1 + \frac{p}{n}\right)^{nt} \tag{3}$$