② A POPULATION OF SMALL GROWS PROPOSITION TO IT'S CURRENT POPULATION. THE INITIAL POPULATION IS 5.000 AND GRAW 4% PER YEAR.

a) FIND AN EQUATION TO MODEL THE POPULATION

$P(0) = 5.000$

LAJU PERTUMBUHAN PENDUDUK :

$$\frac{dP}{dt} = 4\% \cdot P$$

$$\frac{dP}{dt} = \frac{4}{100} P$$

$$\frac{dP}{dt} = \frac{1}{25} P$$

$$\frac{dP}{P} = \frac{1}{25} dt$$

$$\frac{dP}{P} - \frac{1}{25} dt = 0$$

$$\int \frac{dP}{P} - \frac{1}{25} \int dt = \int 0$$

$$\ln P - \frac{1}{25} t = C$$

$$\ln P - \ln e^{\frac{1}{25}t} = \ln C$$

$$\ln \frac{P}{e^{\frac{1}{25}t}} = \ln C$$

$$\frac{P}{e^{\frac{1}{25}t}} = C$$

$$\longrightarrow P(t) = C e^{\frac{1}{25}t}$$

$t = 0 \rightarrow P(0) = C e^{\frac{1}{25}(0)}$

$P(0) = C$

$$P(t) = P(0) e^{\frac{1}{25}t}$$

$$\boxed{P(t) = 5000 e^{\frac{1}{25}t}}$$

b) DETERMINE THE POPULATION AFTER 3 YEARS

$t = 3$

$$P(t) = 5000 e^{\frac{1}{25}t}$$

$$P(3) = 5000 e^{\frac{1}{25}(3)}$$

$$\boxed{P(3) = 5000 e^{\frac{3}{25}}}$$

c) DETERMINE HOW LONG IT WILL TAKE THE POPULATION TO DOUBLE

$P(t) = 2 P(0) = 2(5000) = 10.000$

$$P(t) = 5000 e^{\frac{1}{25}t}$$

$$10.000 = 5000 e^{\frac{1}{25}t}$$

$$2 = e^{\frac{1}{25}t}$$

$$\ln 2 = \ln e^{\frac{1}{25}t}$$

$$\ln 2 = \frac{1}{25} t$$

$$25 \ln 2 = t$$

POPULASINYA MENJADI DUA KALI LIPAT SETELAH $25 \ln 2$ TAHUN