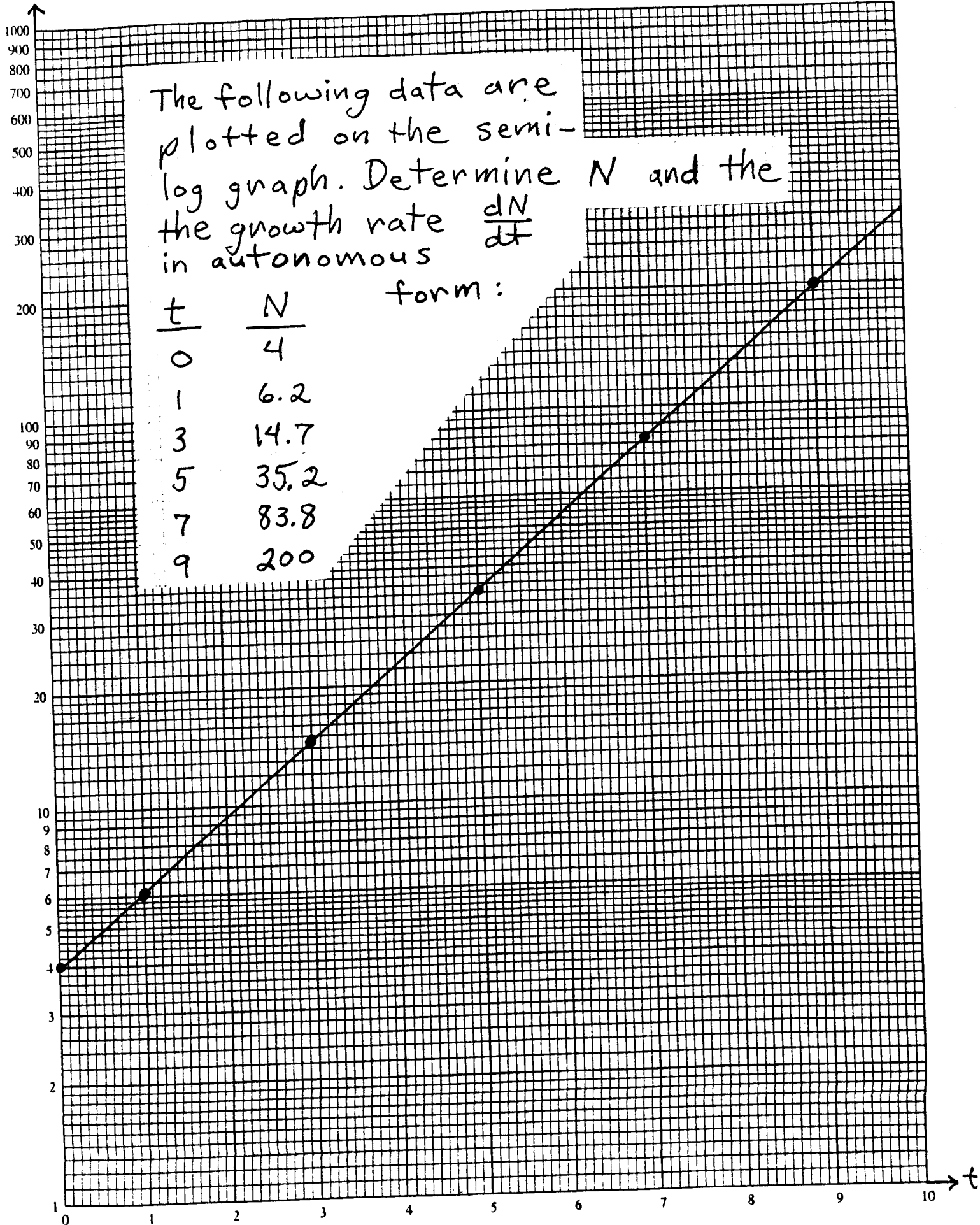


# Problem A

log N



SEE Problem A :

- 1.) Find an equation for  $N$ .
- 2.) Find the growth rate  $\frac{dN}{dt}$  in autonomous form.

assume the graph is a line :

$$Y = mt + b \rightarrow$$

$$\log N = mt + b \rightarrow$$

$$\boxed{b = \log 4} \rightarrow$$

$$\log N = mt + \log 4 ; \text{ (find } m$$

by using any other pt. on the line) let  $t=9, N=200 \rightarrow$

$$\log 200 = m(9) + \log 4 \rightarrow$$

$$\log 200 - \log 4 = 9m \rightarrow$$

$$\boxed{m = \frac{1}{9} \log \frac{200}{4} = \frac{1}{9} \log 50} ;$$

then

$$\log N = \left(\frac{1}{9} \log 50\right)t + \log 4 \rightarrow$$

$$\log N = \frac{t}{9} \cdot \log 50 + \log 4 \rightarrow$$

$$\log N = \log 50^{\frac{t}{9}} + \log 4 \rightarrow$$

$$\log N = \log (4 \cdot 50^{\frac{t}{9}}) \rightarrow$$

$$10^{\log N} = 10^{\log (4 \cdot 50^{\frac{t}{9}})} \rightarrow$$

$$N = 4 \cdot 50^{\frac{t}{9}} \quad \xrightarrow{D}$$

$$\frac{dN}{dt} = \underbrace{4 \cdot 50^{\frac{t}{9}}}_N \cdot \frac{1}{9} \cdot \ln 50 \rightarrow$$

$$\frac{dN}{dt} = \left( \frac{1}{9} \ln 50 \right) N$$

(autonomous)  
growth rate)