

1. Let growth rate be  $k$ . Then

$$\begin{aligned}2 &= e^{k \times h}, \text{ so} \\ \ln 2 &= kh, \text{ so} \\ k &= \frac{\ln 2}{h} \\ &= \frac{\ln 2}{45.5} \\ &\approx 0.0152\end{aligned}$$

Hence the growth rate is approximately 0.0152 per hour.

2. Let growth rate be  $k$ . Then

$$\begin{aligned}2 &= e^{k \times h}, \text{ so} \\ \ln 2 &= kh, \text{ so} \\ k &= \frac{\ln 2}{h} \\ &= \frac{\ln 2}{18} \\ &\approx 0.0385\end{aligned}$$

Hence the growth rate is approximately 0.0385 per hour.

3. Let growth rate be  $k$ . Then

$$\begin{aligned}2 &= e^{k \times h}, \text{ so} \\ \ln 2 &= kh, \text{ so} \\ k &= \frac{\ln 2}{h} \\ &= \frac{\ln 2}{40.5} \\ &\approx 0.0171\end{aligned}$$

Hence the growth rate is approximately 0.0171 per hour.