

Blood alcohol levels

The concentration of alcohol in the blood C (in mg/mL), t minutes after having one drink (15 mL ethanol) is,

$$\rightarrow C(t) = 0.0225 t e^{-0.0467 t}$$

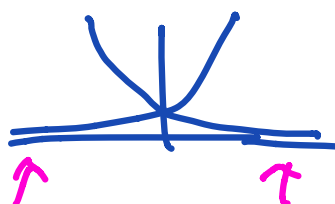
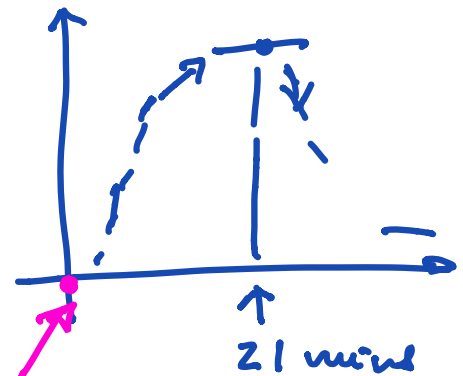
- Is it increasing or decreasing after 1 minute? $C'(t) \rightarrow C'(1)$
- After 5 minutes?
- After an hour?
- What is the maximum concentration? When does it occur?

$$\begin{aligned} a) C'(t) &= 0.0225 \left(t \cdot \frac{d}{dt} [e^{-0.0467 t}] + e^{-0.0467 t} \cdot \frac{d}{dt} [t] \right) \\ &= 0.0225 \left(t e^{-0.0467 t} \cdot (-0.0467) + e^{-0.0467 t} \cdot 1 \right) \\ &= 0.0225 e^{-0.0467 t} (-0.0467 t + 1) \end{aligned}$$

$$C'(1) \approx 0.0204 \quad \frac{\text{mg}}{\text{mL} \cdot \text{min}}$$

$$b) C'(5) \approx 0.0137$$

$$c) C'(60) \approx -0.0025$$



$$d) c'(t) = 0.0225 e^{-0.0467t} (-0.0467t + 1) \stackrel{!}{=} 0$$

no solution

$$-0.0467t + 1 \stackrel{!}{=} 0$$

$$\frac{1}{e^{+0.0467t}}$$

$$t = \frac{-1}{-0.0467}$$

$$= 21 \text{ mins}$$

$$c(21) = 0.0225t e^{-0.0467t}$$

$$\approx 0.1772$$

