

36. **Polonium-210** The half-life of polonium is 139 days, but your sample will not be useful to you after 95% of the radioactive nuclei present on the day the sample arrives has disintegrated. For about how many days after the sample arrives will you be able to use the polonium?

$$y(t) = y_0 e^{-kt}$$

Find time t^* s.t. $y(t^*) = \frac{5}{100} y_0$

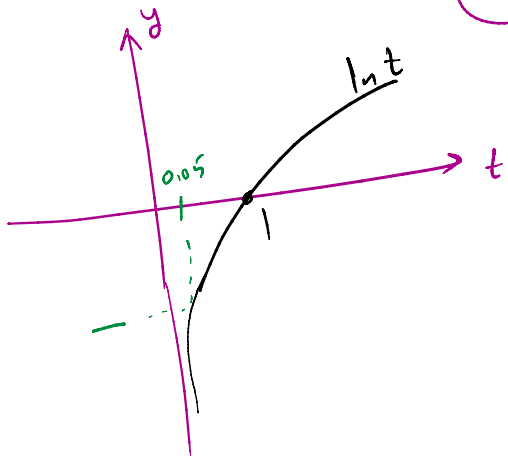
$$y(t^*) = y_0 e^{-kt^*}$$

$$\frac{5}{100} y_0 = y_0 e^{-kt^*}$$

$$0.05 = e^{-kt^*}$$

$$\Rightarrow \ln 0.05 = \ln e^{-kt^*} = -kt^* \ln e = -kt^*$$

$$t^* = \frac{\ln 0.05}{-k} = \frac{\ln 0.05}{-0.285 \times 10^{-4}} \approx \underline{600} \text{ days}$$



$$\underline{T} = 139 \Rightarrow k = \frac{\ln 2}{T}$$

$$= \frac{\ln 2}{139}$$

$$k \approx 0.285 \times 10^{-4}$$

y_0 : initial amount $t=0$

k : decay rate

$y(t)$: amount available at time