Chapter 1:

Radioactive Decay

- number of uranium nuclei present in a sample time t:

$$-\frac{dN_U}{dt} = -\frac{N_U}{\tau}$$

- τ = time constant

- solving for N_U:
  - $N_U = N_U(0)\, e^{-t/\tau}$

Numerical Approach

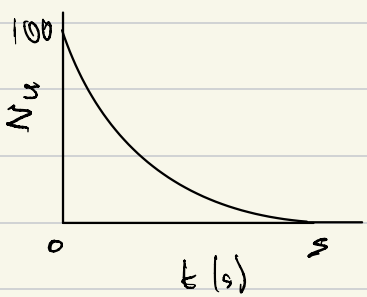
- ignore higher differentials in Taylor expansion
  - $N_U(\Delta t) \simeq N_U(0) + \frac{dN_U}{dt}\Delta t$

- $N_U(t+\Delta t) \simeq N_U(t) + \frac{dN_U}{dt}\Delta t$

- only works for small Δt

Coding the Problem

- steps:
  - declare necessary variables and arrays
  - initialize variables
  - perform calculations
  - store results



- plot aligns with results from Lab 3

Testing the Program

- does output make sense?
- compare results to exact result / theoretical
- step size (dt) should not affect result

Numerical Considerations

- time step variation introduces some error
  - total error: proportional to # of time steps and error per step, $\epsilon / \Delta t$ & Δt^2
- check to see if result converges with smaller step size

Programming Guidelines

- organized: readable & understandable
- descriptive: understandable
- commented: ↑
- clarity: ↑, efficient ≠ better
- clear graphs: labeled & appropriate axes