

## Numerical Methods TIC HOMEWORK

---

Juan David Rojas Gacha

11 de septiembre de 2018

1. A drug administered to a patient produces a concentration in the blood stream given by  $c(t) = \frac{At}{e^{t/3}}$  milligrams per milliliter,  $t$  hours after  $A$  units have been injected. The maximum safe concentration is 1 mg/mL.
  - a) What amount should be injected to reach this maximum safe concentration, and when does this maximum occur?
  - b) An additional amount of this drug is to be administered to the patient after the concentration falls to 0.25 mg/mL. Determine, to the nearest minute, when this second injection should be given.

2. The fourth-degree polynomial

$$f(x) = 230x^4 + 18x^3 + 9x^2 - 221x - 9$$

has two real zeros, one in  $[-1, 0]$  and the other in  $[0, 1]$ . Attempt to approximate these zeros within  $10^{-5}$  using the:

- a) Bisection Method.
  - b) Method of False Position.
  - c) False Position Modified Method.
3. According with *Archimedes principle*, the *buoyancy* force is equal to the weight of fluid displaced by the submerged portion of an object. For the sphere, use bisection and false position within  $10^{-5}$  to determine the height  $h$  of the portion that is above water. Employing the following values for your computation:  $r$  = radius of the sphere = 1m,  $\rho_s$  = density of sphere = 200 kg/m<sup>3</sup>, and  $\rho_w$  = density of water = 1000 kg/m<sup>3</sup>.