

9. [11 points] For this problem, show your work step-by-step and give all answers in **exact form** or accurate to at least three decimal places. Include units.

The concentration (in milligrams per milliliter) of a certain experimental medication (“Medication E”) in a patient’s bloodstream t hours after injection is $C(t) = De^{-1.5t}$, where D is the concentration immediately after the injection.

- a. [2 points] By what percent does the concentration of Medication E in the bloodstream decrease each hour after injection?

Answer: _____

- b. [3 points] What is the half-life of Medication E in the bloodstream?

Answer: _____

Suppose that a patient is given two injections (Medications A and B) at the same time.

- Medication A has an initial blood concentration of 3 mg/ml, and its concentration decreases at a *continuous* hourly rate of 25%.
- Medication B has an initial blood concentration of 4.5 mg/ml, and its concentration decreases at a *continuous* hourly rate of 30%.

Let $A(t)$ and $B(t)$ be the blood concentration (in mg/ml) of Medication A and of Medication B, respectively, t hours after the patient receives these injections.

- c. [2 points] Find a formula for $A(t)$ and a formula for $B(t)$.

$A(t) =$ _____ $B(t) =$ _____

- d. [4 points] How long after the injections will the concentration of Medication B be only 2% more than the concentration of Medication A in the bloodstream?

Answer: _____