

NAME: _____

UNIT 3 • LINEAR AND EXPONENTIAL FUNCTIONS

Lesson 5: Comparing Functions

Problem-Based Task 3.5.2: Analyzing Kidney Function

Renal scans are common medical procedures used to measure how well a person's kidneys are working. The patient is injected with a small amount of radioactive material. Then, a series of computerized scans are taken. The type of radioactive material used for the test depends on the specific kidney function being observed. Two types of radioactive materials used are technetium-99m and indium-113m.

The half-life, or decay rate, of indium-113m is 1.7 hours. The half-life of technetium-99m is modeled by the function $f(x) = 500 \left(\frac{1}{2} \right)^{\frac{x}{6}}$, where $f(x)$ represents the amount of material remaining and x represents hours. There are 500 milligrams of each material. How does the half-life of indium-113m compare with the function representing the half-life of technetium-99m? Which material is decaying at a faster rate? Use a graph to help explain your reasoning.

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Coaching

- a. What is the starting amount of indium-113m?
- b. At what rate does indium-113m decay?
- c. What function represents the half-life of indium-113m?
- d. What function represents the half-life of technetium-99m?
- e. What is the initial amount of technetium-99m?
- f. At what rate does technetium-99m decay?
- g. Graph both functions on one coordinate plane.
- h. Which function is decaying at a faster rate? Use the functions and your graph to explain your reasoning.