

For each problem, show your work. Expressions written in terms of exponentials, natural logarithms, or common logarithms *need not be simplified*.

1. **(9 points)** The radioactive substance quadium has a half-life of 17 days. Answer the following questions about a 75-gram sample of quadium.

(a) **(5 points)** Write a function $f(t)$ representing the quantity of quadium left in the 75-gram sample after t days.

(b) **(5 points)** Using your above formula, how many days will it take the 75-gram sample to decay down to contain only 15 grams of quadium?

2. **(5 points)** Simplify $\log_4 18 + \log_4 100 - 2\log_4 15$, writing your answer as a rational number.

3. **(5 points)** What is the domain of the function $f(x) = \frac{x^2-3}{\log_{10}(4x-2)}$?