

1. (3ea) A certain radioactive substance decays at a continuous rate of 7.2% per year. Suppose 180 grams of the substance are initially present.
 - (a) Write a function of the form $Q(t) = Q_0e^{kt}$ which models the amount of the substance present after t years.

 - (b) Write a function of the form $Q(t) = Q_0a^t$ which models the amount of the substance present after t years.

2. (5) A particular radioactive substance is known to decay according to the continuous exponential model $Q(t) = Q_0e^{-0.112t}$, when t is measured in years. What percentage (to the nearest 0.01%) of the original amount of the substance is left after 5 years?

3. (9) Caffeine is a chemical stimulant found in coffee and some soda. A typical human body eliminates 10% of the compound each hour after ingestion.

Suppose George enjoys a double espresso (60 milligrams of caffeine), at the beginning of a lab class which begins at 1:00 pm.

- (a) Write an exponential function of the form $Q(t) = Q_0(a)^t$ that models the amount of caffeine present in George's body t hours after 1:00 pm.

- (b) Use your model to determine how much caffeine (to the nearest 0.1mg) is left in his system when his class ends at 2:45 pm.

- (c) How much caffeine (to the nearest 0.1mg) remains in his system when he goes to bed at 11:00 pm?