

Population Growth

If $P(t)$ gives a population at time t , write down an equation that models the following statement.

The rate at which a population grows is proportional to the size of the population.

Suppose the initial population is given by $P(0) = P_0$

What does k represent?

The relative growth rate (which is a constant value).

Ex Suppose a population of flies grows at a rate proportional to its size. If there are 100 flies at the beginning and 300 flies after 2 days, find the number of flies after 4 days.

Radioactive Decay

Radioactive substances decay at a rate proportional to the amount of substance present. Let $m(t)$ be the mass of the substance at time t . Write down the differential equation and initial condition that model this process. Write the solution and graph.

Def The half-life of a substance is the time it takes for half of the substance to decay.

Ex Some plutonium isotope Pu-239 was released in the Chernobyl nuclear accident in 1986. If the half-life of Pu-239 is 24,360 years, how long will it take for the plutonium to decay to 10% of the initially released amount.

Compound Interest

Ex If \$5000 is invested at 6.5% interest, find the amount after 8 years if the interest is compounded

(a). Quarterly.

(b). Monthly.

(c). Continuously

Newton's Law of Cooling

The rate at which an object cools is proportional to the temperature difference between the object and its surroundings.