

## 4.5-Exponential Growth and Decay

A solution to the differential equation  $y' = ky$  is:

Exponential Growth/Decay:

Goal: Use given information to find  $C$  and  $k$ .

*Examples:*

Aggigium is a radioactive substance with a half-life of 105 days. If there are 2012g of Aggigium initially, how much remains after  $t$  days? How much remains after 200 days? When will there be only 100g left?

According to UN data, the world population at the beginning of 2000 was 6 billion and growing at a rate of 1.6%. Assuming an exponential growth model, estimate the world population at the beginning of 2015.

Newton's Law of Cooling states that the rate of change in the temperature of an object is proportional to the difference in temperature between the object and its surroundings. A liquid with an initial temperature of  $95^{\circ}\text{C}$  is enclosed in a metal container that is held at a constant temperature of  $25^{\circ}\text{C}$ . If the liquid cools to  $50^{\circ}\text{C}$  after 30 minutes, what will the temperature be after 1 hour?

A tank initially contains 2kg of salt dissolved in 400 liters of water. Pure water enters the tank at a rate of 20 L/min and the mixed solution is drained from the tank at the same rate. Find the amount of salt in the tank after  $t$  minutes.