In this section we will

* Consider some applications using exponential functions

## Exponential Growth and Decay

An Exponential Decay Model is a function of the form:

An Exponential Growth Model is a function of the form:

Where is the quantity present when ,

is the amount present at any time,

And is the growth rate (if ) or decay rate (if .

The **half-life** is the amount of time necessary for half of the quantity to decay.

The **doubling time** is the amount of time necessary for the quantity to double in size.

Ex:

A) In 1970, cruise lines carried approximately 500,000 passengers. This number has increased exponentially to 12.1 million in 2006.

1. Find the exponential growth rate and the exponential growth model/function.
2. Estimate the year in which cruise lines will carry 20 million passengers.

So

So 2011 will be the year

B) The radioactive element carbon-14 has a half life of 5750 years. The percentage of carbon-14 in the remains of organic matter can be used to determine the age of that material. Recently, while digging in Chaco Canyon, New Mexico, archaeologists found corn pollen that had lost 38.1% of its carbon-14. The age of the corn pollen was evidence that Indians had been cultivating crops in the Southwest centuries earlier than scientists had thought. What was the age of the pollen?

So

So about 4000 years old

C) Suppose that $25,000 is invested at 4% interest compounded monthly. In months, it will grow to the amount A given by the modeling function

Find how long it will take to accumulate 80,000 in the account.

Note: t is in months

=349.5 months=29 years 1 month.