MATH 1311

Section 6.4

Equations of Change:

This section will be devoted to finding the equations of velocity functions.

We will concentrate on two specific cases: Linear and Exponential Functions.

Constant Acceleration:

The change of velocity is defined to be acceleration. If acceleration is known to be a constant value, then the velocity function is linear, with the acceleration as the slope.

For example:

On Earth, the acceleration due to gravity is defined as -32 $ft/s^{2.}$ This means that any velocity function for a falling object near to Earth will be given by:

$v(t) = -32t + v_o$, where v_o is the initial velocity.

Example:

A falling object near the surface of Mars has a constant acceleration of -12.16ft/s2. If an object is thrown from the surface of Mars with an initial velocity of 25 ft/s, what would its velocity function be?

At what time will the object stop rising and begin falling?

Constant Percent of Change:

If the percent of change is constant, rather than the amount of change being constant, then the function would be exponential. This is instead of the annual increase of 3%.

For example, every year there is a 3% increase based on the original amount. If this 3% increase is a constant increase of 3%, this would mean that the increase function would be:

$v(t) = p\, e^{rt}$

or in our case: $v(t) = pe^{.03t} = p\,(1.0305)^t$

Example:

An oven is heating constantly heating at 2% of its current temperature. The starting temperature of the oven is 45 degrees. Write an equation for the temperature increase of the oven.

How long will it take the oven to reach a temperature of 150 degrees?

Comparison between Linear and Exponential Models:

Linear models: There is a constant increase of 5 degrees.

Exponential: There is a constant increase of 5% of the current temperature.