Math 104-006

Chapter 10.4: Models for Population Growth

Outline For Today

- Models for Population Growth

Law Of Natural Growth

- The law of natural growth assumes that the rate of change of the population is proportional to the size of the population.

- i.e. that $\dfrac{dP}{dt} = kP$

- This is a separable equation and we can solve it to get that $P(t) = P(0)e^{kt}$

- Where P(0) is the population at time 0.

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The Logistic Model

- Another model of population growth, the **logistic model**, takes into account the fact that if there is a cap on population which can be sustained.

- We call this cap the **carrying capacity K.**

- The equation thing gives us $\dfrac{dP}{dt} = cP\left(1 - \dfrac{P}{K}\right)$

- We call this the **logistic differential equation**

The Logistic Model Continued

- The logistic differential equation is separable so we can solve it and we get

- $$P(t) = \frac{K}{1 + Ae^{-ct}} \quad \text{where} \quad A = \frac{K - P(0)}{P(0)}$$

Other Models

There are also many other models for population growth