MA205 Lesson 45

Exponential Growth/Decay

Tuesday, November 6, 2007

Outline

Admin

Course Guide

Last Class

Modeling ODE's

Board Work

Lesson Link - Logistic Equation

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1. We will have class tomorrow, Wednesday, 7 November 2007, and a drop on Friday, November 2007.

3. Class on Wednesday has been adjusted for COL Jones retirement. A/G hour 0700-0755, B/H hour 0810-0905, and D/J hour 1030-1125.
4. I will hand out Project 3 on Thursday.
5. Homework for Block 3 will be an IPR on Project 3. This will be due Monday, 26 November 07. Each group will email me a short presentation with numbers and a skeleton of their model. More details will be coming.
6. We will have a Quiz this Thursday.

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2. Say it with me! We have class this Wednesday and a drop this Friday!
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Objectives

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- Model and solve situations involving exponential growth.
- Model and solve situations involving exponential decay.
- Model and solve situations involving Newton's Law of Cooling.

Course Guide

Readings

Read

- Stewart, Chapter 9, section 4, pages 611-619.

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Separable Equations

1. Separate
2. Integrate
3. Evaluate

Questions?

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Models

1. Exponential Growth:

$$y(t) = y_0 e^{kt} \quad y(0) = y_0 \quad \frac{dy}{dt} = ky \quad k > 0$$

2. Exponential Decay:

$$y(t) = y_0 e^{kt} \quad y(0) = y_0 \quad \frac{dy}{dt} = ky \quad k < 0$$

3. Newton's Law of Cooling:

$$\frac{dT}{dt} = k(T - T_s)$$

T is the temperature of the object, T_s is the ambient temperature.

Characteristic Equations

Board Work Course Guide PSP 1 & 2 pg 205

1. Find values of r so that the function $y = e^{rx}$ is a solution of the given differential equation.

Characteristic Equations

Board Work Course Guide PSP 1 & 2 pg 205

1. Find values of r so that the function $y = e^{rx}$ is a solution of the given differential equation.
   1.1 $y'' + y' - 6y = 0$

Characteristic Equations

Board Work Course Guide PSP 1 & 2 pg 205

1. Find values of r so that the function $y = e^{rx}$ is a solution of the given differential equation.

   1.2 $y'' + 2y' + y = 0$

Characteristic Equations

Board Work Course Guide PSP 1 & 2 pg 205

1. Find values of r so that the function $y = e^{rx}$ is a solution of the given differential equation.

2. Find values of r so that the function $y = x^r$ is a solution of the differential equation,

$$xy'' + 2y' = 0$$

Problems PSP 1-5, 7-9

Pick a problem

Problems PSP 6 or the Coffee Problem

Pick a problem

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$$\frac{dP}{dt} = P(M - P)$$

Questions