

Math 204 Announcement

Professor Bonita Lawrence of Marshall University will give a lecture on Friday, November 8, 2013 concerning the Differential Analyzer, a mechanical device for solving differential equations up to fourth order using numerical integration. Her talk should be interesting and accessible for students who have taken or are currently taking elementary differential equations. The details of the talk are listed below and an abstract can be found on the next page. Ten extra credit homework points will be awarded to Math 204 students who attend the talk and who complete and submit a short questionnaire.

Who: Professor Bonita Lawrence

What: The Differential Analyzer Project: Solutions of Dynamic Equations Using Mechanical Integration.

When: 3:00-4:00 PM on Friday, November 8

Where: Butler-Carlton Hall 125

**THE MARSHALL DIFFERENTIAL ANALYZER PROJECT:
SOLUTIONS OF DYNAMIC EQUATIONS USING
MECHANICAL INTEGRATION**

**Dr. Bonita Lawrence and Ms. Molly Peterson, *Marshall University,
Huntington, West Virginia, USA***

Abstract Marshall University currently houses the largest publicly accessible differential analyzer in the USA. The machine (fondly known as Art in honor of Dr. Arthur Porter, the first to build a differential analyzer in England) solves up to fourth order differential equations using mechanical integration, a physical process that was first implemented in the late 1920's by Dr. Vannevar Bush at MIT. The Marshall Differential Analyzer Team is a collection of undergraduate and graduate students who have worked together in the construction, maintenance and continuing development of this machine and two smaller more portable two-integrator machine. These machines are currently being used i) as teaching tools, offering a physical interpretation of how the derivatives of a function can be used to determine the structure of the function itself, and ii) as research tool to study qualitative properties of nonlinear equations (without closed form solutions) as well to investigate topics in dynamic equations on time scales.

Students of differential equations and calculus are given the opportunity, as part of their courses, to program the machine, run it and study the behavior of solutions. The perspective the machine offers bright mathematical minds lends credence to the idea that physical models can spark the imagination.

In this presentation we will give an overview of the history of the machine and the Marshall DA Project, discuss the mechanics that the machine (and the operator) uses to model mathematics, and discuss future plans for the Project. The big finale will be a demonstration by my graduate student, Ms. Molly Peterson, of a second order problem on our latest construction, a two-integrator machine we have named DA Vinci.

We look forward to our visit!