

# MA104 Lesson 1

Introduction To Math 104

Monday, 14 January, 2008

# Outline

Who We Are

Who I Am

Who You Are

What We Will Do

Apply Math to Life

How We Will Do It

Syllabus

The Derivative

Course Guide

My Take on the derivative

Look Forward

Course Guide

# Board Work To Warm You Up

**Take Boards!**

1. DO Stewart problem 2.1.1
2. DO Stewart problem 2.1.5

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# Major Bowman's Teaching Style

▶ Major Bowman's Teaching Style

## Major Bowman's Experiences Pre-Military

- ▶ Born and Raised in Olympia Washington until 14 years old

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- ▶ Commissioned Into the Engineer Branch

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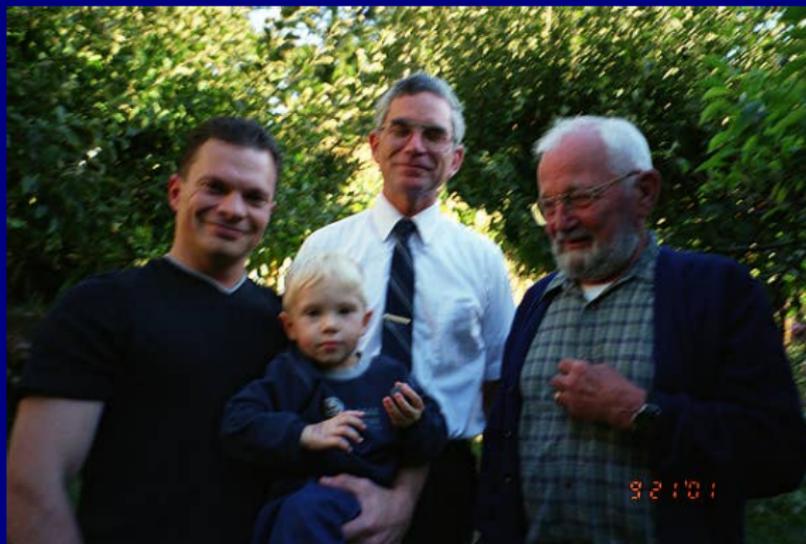
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- ▶ Fire Team Leader in Wild Land Forest Fires in Montana

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- ▶ Took Command of A54th Engineer Battalion in Iraq

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- ▶ Changed Command - Worked for 1ID Engineer Brigade

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- ▶ Trained to go to Afghanistan - Including Riot Control
- ▶ Company Commander at CMTC
- ▶ Son Nathan Born while in Command
- ▶ Changed Command - Worked for 11D Engineer Brigade
- ▶ Moved to Naperville for Master's Degree at University of Illinois Chicago

# Major Bowman's Experiences Military - Captain



# Major Bowman's Experiences Military - Major

- ▶ Promoted to Major at the Naperville VFW

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# Major Bowman's Experiences Military - Major

- ▶ Promoted to Major at the Naperville VFW
- ▶ Graduated from UIC

# Major Bowman's Experiences Military - Major



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# Major Bowman's Hobbies

## ▶ Hobbies

- ▶ Brewing Beer
- ▶ Riding dirt bikes with my Son Andrew
- ▶ Lifting Weights
- ▶ Listening to Music
- ▶ Driving and working on my 1965 Mustang
- ▶ Snow boarding with my Son Andrew

# Major Bowman's Hobbies



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# Who Are You

- ▶ A Little Exercise to find out who you are

# Who Are You

- ▶ A Little Exercise to find out who you are
- ▶ Make Sure SynchronEyes is working

# Who Are You

- ▶ A Little Exercise to find out who you are
- ▶ Make Sure SynchronEyes is working
- ▶ **Oh No Not a Quiz!!!!**

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# Tsunamis

## Thesis

# Course and Block Objectives

Look at your Course Guide for Objectives. Check the objectives to see if you know them all before a test.

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# My Web Page

▶ My Web Site

# Syllabus Ground Rules

## Ground Rules:

1. Items to bring to class every day
  - 1.1 Textbook
  - 1.2 Course Guide
  - 1.3 Laptop
2. Drinks
  - 2.1 Water allowed in any spill-proof water bottle.
  - 2.2 Other beverages must be in Dean approved mug only
3. Food - No Food or Gum
4. Bathroom - Just go, don't distract others if possible
5. Answering Questions - If a VIP visits the room raise your right hand if you know the answer or raise your left hand if you don't.

# Syllabus Ground Rules

## 1. Class Preparation

- 1.1 Come to class having completed the reading assignment and the DO problems listed in the course guide
- 1.2 Read in two phases:
  - 1.2.1 Initial Scan - highlight formulas
  - 1.2.2 Second Read - try to understand concepts or examples

## 2. Assignment and Project Deadlines

- 2.1 Timely submission of academic requirements is a duty. All assignments will be turned-in during class. Late submissions, without prior approval, require academic penalty.
- 2.2 If extenuating circumstances prevent a cadet from submitting the assignment on time, I may extend the submission deadline. In such cases, if the extended deadline is met, the submission is not late.

# Syllabus Ground Rules

1. Graded quizzes will be taken weekly, depending on how many we take I will drop some of the lowest scores.
2. Homework
  - 2.1 Block Homework will be given during each block. The problems will cover material already covered and some from material not yet covered. These assignments will not be due until after the material has been covered.
  - 2.2 DO Problems will be due daily at the beginning of class. Turn in your paper work copy to the section marcher. Submit your answers on Web Assign prior to class. Your participation in these problems will go towards your participation points in the class.
3. Problem Solving Labs - No quizzes will be given during PSL. Usually will include small experiments or involved board problems.

# Syllabus Ground Rules

## 1. **Bonus Point Opportunities**

- 1.1 Cadets who bring in an application of that days topic that is not listed in the book or course guide will be eligible for bonus points, positive spot reports, or an additional low quiz drop. Cadets will vote on the relevance and quality of the application. I will be the final vote. Cadet should include a video, computer application, or physical model and be able to defend their application.
- 1.2 Course Guide spot checks
- 1.3 Attendance of Math Forums
- 1.4 Pictures of you on vacation or in historical places with the Stewart Text

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# Objectives

1. Approximate the slope of the tangent line at a point on a given curve using the slopes of secant lines.
2. Approximate instantaneous rates of change using average rates of change.

# READ

1. Instructional Memorandum 104-2 to include enclosures.
2. Stewart: Section 2.1, pages 83-86.
3. Student Notes.

# THINK ABOUT

1. What is the relationship between tangent lines and instantaneous change?
2. Secant lines and average change?

# DO Problems

1. Section 2.1/ 1, 2, 5, 7

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# My Take on the derivative

1. Average Rate of Change versus
2. Instantaneous Rate of Change
3. **Instantaneous rate of change is the limiting value of the average rate of change, and instantaneous rate of change is precisely what a derivative is.**
4. The last statement is crucial to your understanding of differential calculus and to your success in this course.

## A problem using the derivative

$$\blacktriangleright v_{average} = \frac{\text{change in displacement}}{\text{change in time}}$$

## A problem using the derivative

- ▶  $v_{average} = \frac{\text{change in displacement}}{\text{change in time}}$
- ▶  $= \frac{\Delta d}{\Delta t} = \frac{50 \text{ miles} - 0 \text{ miles}}{1 \text{ hour} - 0 \text{ hour}} = 50mph$

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- ▶  $= \frac{\Delta d}{\Delta t} = \frac{50 \text{ miles} - 0 \text{ miles}}{1 \text{ hour} - 0 \text{ hour}} = 50mph$
- ▶ Where  $\Delta$  is the Greek capital letter "delta" which means "change in". So in our case  $\Delta d$  is the change in distance or displacement from the start point and  $\Delta t$  is the change in time. However,  $\Delta$  can be a change in anything.

## A problem using the derivative

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- ▶ So instantaneous change is given by  $= \lim_{\Delta t \rightarrow 0} \frac{\Delta d}{\Delta t}$ .

## Another problem using the derivative

You are collecting data about your unmanned, tracked, M1 Panther. You would like to know what the robot's velocity was during your tests. You collected the following data:

<b>Time (seconds)</b>	<b>Distance Traveled (meters)</b>
0	0
1.5	1.4
1.7	1.75
1.9	1.9
2	2.01
2.1	2.01
2.1	2.1
2.3	2.35
2.5	2.6

1. What was the Panther's average speed during the test?
2. Estimate the robot's average velocity between 1.7 and 2 seconds.
3. Estimate the robot's instantaneous velocity at 2 seconds.

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## 1. OBJECTIVES:

- 1.1 Understand what it means for a sequence to have a limit.
- 1.2 Find the limiting value of a given sequence graphically, algebraically, and numerically.

## 2. READ:

- 2.1 Stewart: Section 11.1, pages 675-679 (Stop at The Squeeze Theorem).
- 2.2 Student Notes.

## 3. THINK ABOUT:

- 3.1 What does it mean for a sequence to converge?
- 3.2 Can you come up with a sequence that does not converge?

## 4. DO:

- 4.1 Section 11.1/ 1, 2, 17, 24, 44, 49

# Questions?

See you Tomorrow!