MA 16020 – Applied Calculus II: Course Introduction

Instructor and Class Information

- **Instructor:** General Ozochiawaeze (call me General and salute!)
- **Sections:** 150 and 160
- **Classroom:** WALC 3127
- **Times:**
  - Section 160: 7:30 AM, MWF
  - Section 150: 8:30 AM, MWF
- **Office Hours:** TBD
- **Instructor Email / Contact:** oozochia@purdue.edu
- Lecture notes, quiz solutions, and other course resources available at: `https://obiorag.github.io/teaching/`

Course Logistics

- **Calculator:** Any non-graphing, non-programmable scientific calculator may be used, e.g., TI-30Xa or similar models.
- **Homework:**
  - 35 assignments total, 10 points each on Achieve.
  - Two lowest scores dropped.
  - Due 11:59pm the day of the next lecture.
  - Online discussion board available on **Piazza**.
  - Check Piazza first to see if your question has already been answered.
  - Email me before 6:00 PM (Sun–Fri) for a same-day response.
  - Extensions only granted in extenuating circumstances.
    Homework $= 10\%$ of course grade.
- **Exams:**
  - Three 1-hour midterms (100 points each).
  - One comprehensive 2-hour final (200 points).
  - All exams are multiple-choice, machine-graded.

Textbook and Homework Access

- **Textbook:** Electronic textbook with videos available through **Achieve**. Access link: Brightspace → Contents → Achieve.
- **Homework:** Online homework via Achieve. Links are in Brightspace → Contents → Achieve. Homework is organized by exam content.
- Full course schedule available online: `https://www.math.purdue.edu/academic/courses/semester/202610/ma16020/MA16020_Course_Calendar_F25-1.pdf`
- For more information, visit the course webpage: *MA 16020 Course Page*

Quizzes

- Quizzes will be announced during the class **before** the one when they will take place, and will always be on a Wednesday.
- Duration: 10–15 minutes.
- Questions similar to homework and in-class examples.
- Each quiz worth 10 points:
  - 2 questions (4 points each)
  - 2 free points for name/date
- No make-up quizzes allowed.
- Excused absences with proper documentation will excuse your quiz score.

Exam Dates

Exam	**Date & Time**	**Location**
Exam 1	Monday, September 15, 6:30–7:30 pm	TBA
Exam 2	Monday, October 20, 6:30–7:30 pm	TBA
Exam 3	Monday, November 17, 6:30–7:30 pm	TBA
Final Exam	TBA	TBA

Course Grade Distribution

Component	**Percentage**
Homework	10%
Quizzes	10%
Exam 1	16%
Exam 2	16%
Exam 3	16%
Final Exam	32%
Total	**100%**

Email Etiquette

- Always include a **subject line**.
- Include your **first and last name** at the end of the email.
- Attach a picture of the problem and your work; makes life easier!

Example:

```
Subject Line: Homework 5, #7
Hi General,
I am having trouble with #7. I have my work attached.
I think it is the algebra that I'm struggling with.
Thanks,
Daniel Jackson
```

- Grades **cannot be discussed via email**. Please set up a meeting for grade discussions.

What is a Derivative?

- Intuitively: measures **rate of change**.
- Slope of the tangent line to a curve.
- If $y = f(x)$, derivative at $x = a$ is

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}.$$

- Physical meaning: velocity is the derivative of position.

What is it For?

- Finding instantaneous rates of change.
- Modeling growth/decay.
- Optimizing functions (max/min problems).
- Describing sensitivity of one variable to another.

Basic Rules

- Constant Rule: $\frac{d}{dx}[c] = 0$
- Power Rule: $\frac{d}{dx}[x^n] = nx^{n-1}$
- Constant Multiple Rule: $\frac{d}{dx}[cf(x)] = cf'(x)$
- Sum/Difference Rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$
- Product Rule: $\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$
- Quotient Rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$

Chain Rule

- Suppose $y = f(g(x))$, i.e. y is a composition of two functions.
- **Newton notation:**

$$(f \circ g)'(x) = f'(g(x)) \cdot g'(x)$$

- **Leibniz notation:**

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx},$$

  where $u = g(x)$ and $y = f(u)$.
- Interpretation: Differentiate the *outer function* (leaving the inside intact), then multiply by the derivative of the *inner function*.

Example: Chain Rule in Action

- Let $y = \sin(x^2)$.
- **Newton notation:**

$$\frac{d}{dx}\left(\sin(x^2)\right) = \cos(x^2) \cdot (2x) = 2x\cos(x^2).$$

- **Leibniz notation:**

$$y = \sin(u), \quad u = x^2,$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx} = \cos(u) \cdot (2x) = 2x\cos(x^2).$$