MATH 205 Survival Guide - Pre-Calculus & Calculus I Review

By Frogge

1   Motivation

Some students might be taking MATH 205 years after their last pure math course. Even those who aren't will find this useful because no other course (in my recent memory) leans so heavily on pre-calculus aptitude. This chapter highlights all topics that are indirectly covered by MATH 205 exams.
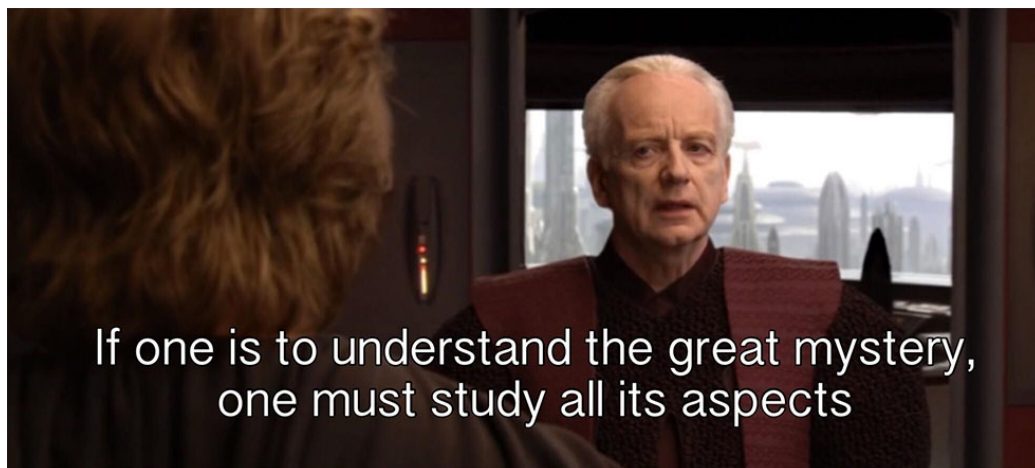

Figure 1: Emperor Palpatine on the necessity of studying the prequels of Calculus II.

2   Algebra & Trig Review

There's an Algebra & Trig Review section in Paul's Notes. It's short and sweet, and specifically designed as a refresher for Calculus.

The following sections can be skipped but the rest are essential:

- Solving Inequalities

- Absolute Value Equations and Inequalities

Figure 2: SpongeBob graphs a quadratic equation.

3   Algebra

Paul's Notes also has an Algebra section. Make sure to check out the solutions to the sample problems because they're very detailed and they're usually half of the lesson.

Some sections are particularly relevant to MATH 205:

1   Preliminaries

All sections in this chapter can be useful depending on your weak points. But polynomials are especially important: multiplying and factoring them should be second nature.

- Polynomials
- Factoring Polynomials
- Rational Expressions

2   Solving Equations and Inequalities

Every exam includes 2 or 3 quadratic equations to solve.

- Quadratic Equations, Part I
- Quadratic Equations, Part II
- Quadratic Equations: A Summary

3   Graphing and Functions

The exams involve graphing between 3 to 5 functions. Ellipses and hyperbolas are not on the menu and can be skipped entirely.

- Graphing
- Lines
- Circles
- Graphing Functions
- Inverse Functions

4 Common Graphs

- Lines, Circles and Piecewise Functions
- Parabolas
- Miscellaneous Functions
- Transformations
- Symmetry

5 Polynomial Functions

- Partial Fractions

4 Calculus I

Honestly most of Calculus I does not come back in Calculus II. But what does come back pops up very often.

Paul once again has great notes on Calculus I. Make sure to check out the detailed solutions. Here's the relevant sections for MATH 205:

1 Limits

Limits are a good 20-30% of the exam.

- One-Sided Limits
- Limit Properties
- Computing Limits
- Infinite Limits
- Limits at Infinity, Part I
- Limits at Infinity, Part II
- Continuity

2 Derivatives

Derivatives show up in nearly all integration problems and some series problems. They're much simpler than in Calculus I though. Knowledge of all the common derivative formulas and the product, quotient, and chain rules is enough.

- Differentiation Formulas
- Product and Quotient Rule
- Chain Rule

3 Applications of Derivatives

L'Hospital's rule is an essential limit evaluation technique.

- L'Hospital's Rule and Indeterminate Forms

Common Derivatives

$$\frac{d}{dx}(x) = 1$$

$$\frac{d}{dx}(\sin x) = \cos x$$

$$\frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

$$\frac{d}{dx}(\csc x) = -\csc x \cot x$$

$$\frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}(\cos^{-1} x) = -\frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$$

$$\frac{d}{dx}(a^x) = a^x \ln(a)$$

$$\frac{d}{dx}(\mathbf{e}^x) = \mathbf{e}^x$$

$$\frac{d}{dx}(\ln(x)) = \frac{1}{x}, \ x > 0$$

$$\frac{d}{dx}(\ln|x|) = \frac{1}{x}, \ x \neq 0$$

$$\frac{d}{dx}(\log_a(x)) = \frac{1}{x \ln a}, \ x > 0$$

Figure 3: Common derivative formulas from Paul Dawkins' Calculus Cheat Sheet.