

**Disclaimer:** This Final Exam Study Guide is meant to help you start studying. It is not necessarily a complete list of everything you need to know.

The MTH 132 final exam mainly consists of standard response questions where students must justify their work. In addition to these, the Final Exam may consist of: fill in the blank, true/false, or multiple choice questions.

Most instructors agree that a good way to study for the final is to do lots of problems to help familiarize yourself with all of the concepts covered.

Sections containing similar concepts have been grouped in blue boxes. Most MTH 132 final exam writers agree that the items below contain crucial material for showcasing MTH 132 knowledge and are therefore **very important**. Expect at least one problem from each group on the final exam.

**Important Items from Each Section:**

1.5 - The Limit of a Function

- Be able to determine if a limit of a function exists by looking at a graph or piecewise defined function.

1.6 - Calculating Limits Using the Limit Laws

- Recall the limit laws and how to use algebra to manipulate limits.
- Know the definition and how to calculate one sided limits.
- Recall that  $\lim_{x \rightarrow a} f(x) = L$  if and only if  $\lim_{x \rightarrow a^-} f(x) = L = \lim_{x \rightarrow a^+} f(x)$ .
- Know the Squeeze Theorem.

1.8 - Continuity

- Know the definition of a continuous function.
- Be able to use the Intermediate Value Theorem.

2.4 - Derivatives of Trigonometric Functions

- Know that  $\lim_{u \rightarrow 0} \frac{\sin u}{u} = 1$  and  $\lim_{u \rightarrow 0} \frac{\cos u - 1}{u} = 0$  and be able to use these within limit problems.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 1.5.11 | • 1.6.50 | • 1.8.53 |
| • 1.6.2  | • 1.8.36 | • 2.4.39 |
| • 1.6.21 | • 1.8.45 | • 2.4.45 |

**Important Items from Each Section:**

2.2 - The Derivative as a Function

- Use the limit definition below to formally calculate the derivative of  $f$ :

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 2.2.21 | • 2.2.25 | • 2.2.27 |
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**Important Items from Each Section:**

## 2.3 - Differentiation Formulas

- Recall the power, product, and quotient rules.

## 2.4 - Derivatives of Trigonometric Functions

- Recall the formulas for the derivatives of all the trig functions. Be able to develop them using the power, product, and quotient rules.

## 2.5 - The Chain Rule

- Be able to apply the chain rule.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 2.5.2  | • 2.5.31 | • 2.7.5  |
| • 2.5.17 | • 2.5.42 | • 2.7.7  |
| • 2.5.22 | • 2.5.69 | • 2.7.10 |

**Important Items from Each Section:**

## 2.6 - Implicit Differentiation

- Be able to use a variety of differentiation rules (most importantly the chain rule) to implicitly differentiate.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 2.6.19 | • 2.6.27 | • 2.6.59 |
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**Important Items from Each Section:**

## 2.8 - Related Rates

- Translate real world problems into solvable math equations.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 2.8.5  | • 2.8.18 | • 2.8.27 |
| • 2.8.15 | • 2.8.20 | • 2.8.31 |

**Important Items from Each Section:**

## 2.9 - Linear Approximations and Differentials

- Recognize the tangent line as the linearization function.
- Be able to solve for the linearization function.
- Use the linearization function to approximate.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 2.9.6
- 2.9.23
- 2.9.27

**Important Items from Each Section:**

## 3.1 - Maximum and Minimum Values

- Know how to find the critical numbers.
- Classify absolute maximums and minimums on a closed interval using the **Closed Interval Method**.

## 3.3 - How Derivatives Affect the Shape of a Graph

- Know the **Increasing/Decreasing Test** and the **Concavity Test**.
- Understand how to apply **The First Derivative Test** and **The Second Derivative Test**.
- Know the definition of inflection points and how to find them.

## 3.4 - Limits at Infinity; Horizontal Asymptotes

- Recall the definition for Horizontal and Vertical Asymptotes.

## 3.5 - Summary of Curve Sketching

- Be able to complete each of the **Guidelines for Sketching a Curve**:
  - Domain.
  - Intercepts.
  - Asymptotes.
  - Intervals of Increasing/Decreasing.
  - Local Maximums and Minimums.
  - Concavity and Points of Inflection.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 3.5.9
- 3.5.16
- 3.5.30

**Important Items from Each Section:**

## 3.7 - Optimization Problems

- Understand the **Steps in Solving Optimization Problems:**
  - Understand the Problem.
  - Draw a Diagram.
  - Introduce Notation.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 3.7.12 | • 3.7.32 | • 3.7.39 |
| • 3.7.18 | • 3.7.35 | • 3.7.48 |

**Important Items from Each Section:**

## 3.9+ - Antiderivatives

- Be able to calculate Antiderivatives.
- Know how to solve for  $C$  when given an initial value.

## 4.2 - The Definite Integral

- Know the properties of the Definite Integral.

## 4.3 - The Fundamental Theorem of Calculus

- Know and be able to use the two parts of **The Fundamental Theorem of Calculus.**

## 4.4 - Indefinite Integrals and the Net Change Theorem

- Recognize the table of indefinite integrals as antiderivatives so you don't need to memorize them all.

## 4.5 - The Substitution Rule

- Know how to apply  $u$ -substitutions in definite and indefinite integrals.
- Recognize the **Integrals of Symmetric Functions** properties and be able to apply them.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

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|----------|----------|----------|
| • 4.5.7  | • 4.5.22 | • 4.3.9  |
| • 4.5.17 | • 4.5.38 | • 4.3.18 |

Most MTH 132 final exam writers agree that the items below contain material that is also **important**. However the appearance of problems below tend to fluctuate more from semester to semester. Students wishing to do well on the final should be familiar with this material as well.

**Important Items from Each Section:**

3.2 - The Mean Value Theorem

- Understand the statement and result of The Mean Value Theorem.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 3.2.3
- 3.2.9
- 3.2.19

**Important Items from Each Section:**

3.8 - Newton's Method

- Recall the formula  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$  or be able to derive it logically from a picture.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 3.8.7
- 3.8.11
- 3.8.34

**Important Items from Each Section:**

4.1 - Areas and Distances

- Know how to estimate the area under graphs using:
  - Left Endpoints.
  - Right Endpoints.
  - Midpoints.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 4.1.2
- 4.1.3
- 4.1.13

**Important Items from Each Section:**

4.2 - The Definite Integral

- Know summation formulas and properties.
- Know the formal definition of the integral:  $\int_a^b f(x)dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i^*)\Delta x$  and be able to apply it.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 4.2.18
- 4.2.21
- 4.2.22

**Important Items from Each Section:**

## 5.1 - Area Between Curves

- Know how to find the area between curves by integrating in terms of  $x$  or  $y$ .

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 5.1.6
- 5.1.11
- 5.1.12

**Important Items from Each Section:**

## 5.5 - Average Value of a Function

- Know the formula for average value of a function:  $f_{ave} = \frac{1}{b-a} \int_a^b f(x)dx$ .
- Learn **The Mean Value Theorem for Integrals** and be able to apply it.

**Good Final Exam Review Problems:** (from Stewart Calculus 7th ed.)

- 5.5.5
- 5.5.7
- 5.5.14