

MIDTERM II STUDY GUIDE

CHAPTER 4:

- **Section 4.1**

Absolute maximum and minimum

Local maximum and minimum

Relationship between the derivative and extremas. Name the scenarios illustrating what can happen.

Critical number. How is it related to local min or max.

How do we find absolute max and min values of a continuous function on a closed interval?

- **Section 4.2**

Understand and know the statement of the Mean Value Theorem. Be able to apply it.

How can we illustrate this theorem graphically?

What can you tell about the functions whose derivatives are equal?

- **Section 4.3**

Increasing/Decreasing Test.

First Derivative Test.

How can we find local maximum and minimum values?

How can we find global extremas on an open interval?

What is the relationship between the second derivative and the graph of a function.

Definition of concave upward and concave downward.

Concavity test.

Inflection points.

Second derivative test (sometimes it is a lot easier to use this test).

- **Section 4.4** This was covered on the first exam, but the results of this section are used for curve sketching in Section 4.5.

- **Section 4.5** The new concepts here were:

Symmetry. Know the definition of odd and even functions and be able to use this definition to show that a function is even or odd.

Slant Asymptotes

Combine this with earlier results to sketch a function.

- **Section 4.7**

Optimization Problems.

Remember to set up a function representing the value you are trying to maximize or minimize!

Figure out a way to do it in one variable.

After that, it's just finding an absolute maximum or minimum.

Remember to show that what you have found is actually a max or min, not just a critical number!!!

- **Section 4.10**

Definition of antiderivative of a function. Is it unique?

How can you categorize all antiderivatives of a given function? How will their graphs be different?

Power rule for finding antiderivative.

Antiderivatives of $\cos x$, $\sin x$, $\sec^2 x$, $\sec x \tan x$, $\csc^2 x$, $\csc x \cot x$

CHAPTER 5:

- **Section 5.1**

How can we approximate the an area under a graph of a nonnegative continuous function by rectangles? Explain how the rectangles are created and how the area is found.

How can we improve this approximation?

How can we find the exact area under this graph?

- **Section 5.2**

Definition of a Definite Integral. You need to give a formula, plus explain what it represents.

Be able to evaluate (simple) integrals with this definition. (The summation formulas for

$\sum_{i=1}^n i$, $\sum_{i=1}^n i^2$, $\sum_{i=1}^n i^3$, will be provided on the exam.)

Reimann Sum, how do we find it? What does it represent?

Of course, you need to understand the sum notation!

Relationship between the areas under the graph and the integral. (Remember, that this is one way we can evaluate the integrals).

Properties of Definite integrals.

- **Section 5.3**

Know and understand Fundamental Theorem of Calculus (Both Parts).

Be able to apply it to problems.

Second part of this theorem gives us a great technique to evaluate definite integrals.

- **Section 5.4**

Indefinite Integral. What does it mean?

Net Change Theorem.

How can we find displacement over a given time interval give the velocity function?

How can we find the total distance travelled?

- **Section 5.5**

SUBSTITUTION RULE! You need to be very comfortable with it by now.

Integrals of symmetric functions.

- **General comments for evaluating integrals:**

Know the technique for evaluating integrals containing absolute values.

Watch out for infinite discontinuities.

Check if a function is symmetric.

Try to simplify the function if you can, before finding the antiderivatives.

Don't forget to update your limits of integration when finding the definite integrals by u-substitution.

What do we do when it is indefinite integral?

Remember, you can easily check your work for these problems.

CHAPTER 7:

• Section 7.1

Definition of a one-to-one function

Definition of the inverse function

Relationship between domain and range of f and f^{-1} .

Cancellation equations

How do we find an inverse of a one-to-one function?

Relationship between the graphs of f and f^{-1} .

How can we find derivative of the inverse function at a point a ? (there are 2 ways).

• Section 7.2*

Definition of $\ln x$ (be careful with the domain).

How can $\ln x$ be represented using the graph of $y = \frac{1}{t}$?

Derivative of $y = \ln x$

Laws of Logarithms

The graph of $y = \ln x$

Number e .

Antiderivative of $1/x$

Logarithmic differentiation.

• Section 7.3*

What do we mean by $\exp(x)$?

Relationship between $y = \ln x$ and $y = e^x$.

Properties of the exponential function

Laws of exponents

Derivative of e^x

Antiderivative of e^x

Solving equations containing exponential or logarithmic functions.

• Section 7.4*

Exponential function with base a .

Derivative of a^x , antiderivative of a^x .

Power rule vs Exponential Rule when evaluating derivatives.

Be able to find derivatives of the following functions (a, b are constants): 1. a^b , 2. $[f(x)]^b$, 3. $a^{f(x)}$, 4. $f(x)^{g(x)}$.

$\log_a x$ function

Change of Base Formula.

Derivative of $\log_a x$.

• **Section 7.5**

$\sin^{-1}x$ function, it's domain and range.

$\cos^{-1}x$ function, it's domain and range.

$\tan^{-1}x$ function, it's domain and range.

Derivatives of $\cos^{-1}x$, $\sin^{-1}x$, $\tan^{-1}x$.

Know the values of this functions involving the common angles.

Antiderivatives of $\frac{1}{\sqrt{a^2 - x^2}}$, $\frac{1}{x^2 + a^2}$

Know how to evaluate things like $\arcsin(\sin a)$ for a common value of a. You need to be careful with domains and ranges here.

Additional Review Material:

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True-False quiz: 1-15 (odd)

Exercises: 1-5(odd), 13, 15, 17, 23, 43, 53, 55, 57

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Concept Check: 1, 2, 3, 5, 6

True-False quiz: 1, 2, 3, 4, 6, 7, 9, 11

Exercises: 1, 2, 3, 4, 5, 8, 9-27(odd),33-37(odd),44

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Concept Check: 1, 2, 5(a-g)

True-False quiz: 1, 3, 5, 8, 9, 10, 11, 12, 16, 17

Exercises: 1, 2, 3, 7, 11, 13, 15, 17, 21, 23, 27, 28, 29, 31, 33, 39, 41, 57, 63, 65, 91, 93, 95, 97, 99
101, 103