MAC 2313
Lecture Notes

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Contents

Chapter 1

Preface

1.1 Examples

Theorem 1.1 Theorem
Hello World!

Definition 1.1: Definition Test

Definition Example

Lenma 1.1 Lenma Test
Lenma Example

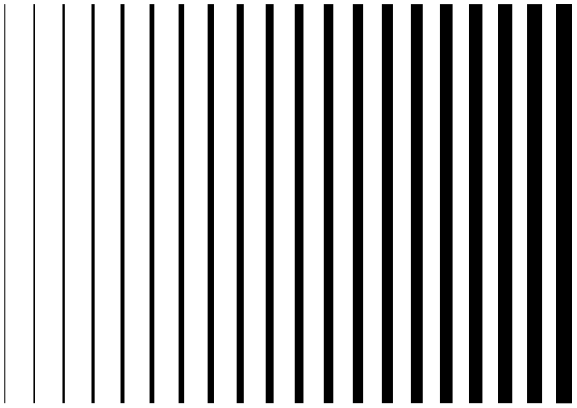
Proof 1.1 test
hello world

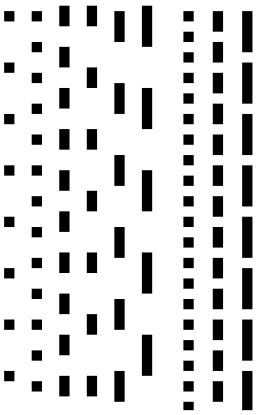
Exercise 1.1 Exercise Test
Ex Example

Example 1.1 (Example Test)
Hello World Example!

Definition 1.2: Limit Test

$$\lim_{x \to \infty} \frac{1}{x}$$





Chapter 2

Unit 3

2.1 Lecture 1

2.1.1 Double Integrals Intro

Definition 2.1: Double Integrals

The double summation of multivariable integrals is defined as:

$$\sum_{i=1}^{\infty}\sum_{i=1}^{\infty}\Delta x\Delta y f(x_i,y_i)=\iint_R f(x,y)DA$$

Where R is the independent x and y ranges or Δx and Δy and A is the area defined by those ranges. R does not have to be rectangular and can be defined by the area of functions.

Double Integrals can be easily defined as twice iterated integrals.

Lenma 2.1 Simple dA definition under the x and y coordinate system

$$dA=dxdy \quad \text{OR} \quad dA=dydx$$

Definition 2.2: Volume of a box with height c

$$\iint_R cDA=c\iint_r DA=cA(R)$$

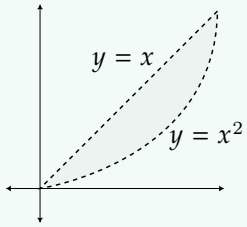
Theorem 2.1 Fubini's Theorem

Let $a\le x\le b$ and $g_1(x)\le y\le g_2(x)$
Let $c\le x\le d$ and $h_1(y)\le x\le h_2(y)$
Then for a continuous function $f(x,y)$ or R

$$\begin{aligned}\iint_R f(x,y)dA &= \int_a^b\left[\int_{g_1(x)}^{g_2(x)} f(x,y)dy\right]dx\\ &= \int_c^d\left[\int_{h_1(y)}^{h_2(y)} f(x,y)dy\right]dx\end{aligned}$$

Alike partial derivatives, we can compare this to a partial integral.

Example 2.1 (Example with figure given)



$$\iint_R f(x,y)dA = \int_0^1 \left[\int_{x^2}^{x} f(x,y)dy\right] dx \tag{2.1}$$

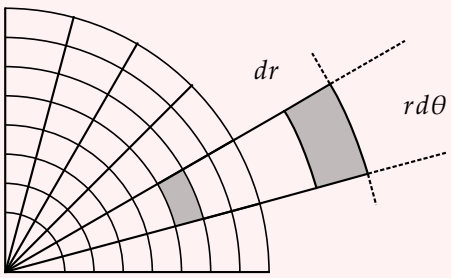
$$= \int_0^1 \left[\int_{y}^{\sqrt{y}} f(x,y)dy\right] dx \tag{2.2}$$

Definition 2.3: Average Area

$$\text{Average Area} = \frac{1}{A(R)} \iint_R f(x,y)\, dA$$

2.1.2 Polar Coordinates

Definition 2.1: Polar Coordinates



$$x = r\cos\theta \qquad x^2 + y^2 = r^2$$
$$y = r\sin\theta \qquad \frac{y}{x} = \tan\theta$$