

MATH 223 - Linear Algebra

Richard Ni

McGill University

Table of Contents

MATH 223 - Linear Algebra	1
<i>Richard Ni</i>	
Lecture 1	1
1 Complex Numbers	1
1.1 Addition of Complex Numbers	1
1.2 Multiplication	2
1.3 Division	2
1.4 Euler's Formula	2

Lecture 1

Office Hours - Monday (11-12h), Thursday (14-15h), After Class (30min) @
Burnside 926

1 Complex Numbers

New Number System (C) - all complex numbers (all z)

Standard Number System (R) - all real numbers

ex. $1 + 2i$, $5 + 11i$, $\sqrt{2} + \frac{11}{7}i$

\mapsto you need **two** real numbers to denote **one** complex number

★ General Form: $z = x + iy$

Ring: Addition and multiplication operations in a set

Field: Ring with division

1.1 Addition of Complex Numbers

ex. $(1 + 3i) + (2 + 5i) = 3 + 8i$

Simply add them up

1.2 Multiplication

ex. $(1 + 2i)(1 + 3i) = i + 5i + 6i^2$

Gauss Fact: Add the rule $i^2 = -1$

$$= -5 + 5i$$

1.3 Division

Complex Conjugate: $\bar{z} = x - iy$

$\mapsto z\bar{z}$ is a real number

$\mapsto |z| = \sqrt{z\bar{z}} = \text{radius}$

Division of Complex Numbers

$$\frac{1}{z} = \frac{\bar{z}}{z\bar{z}} = \frac{x-iy}{x^2+y^2} = \frac{x}{x^2+y^2} - \left(\frac{y}{x^2+y^2}\right)i$$

1.4 Euler's Formula

$$e^{i\theta} = \cos^2(\theta) + i\sin^2(\theta)$$

$$z = re^{i\theta}$$