

MAS125 Calculus II 2006-2007

Problem sheet for exercise class 1

- **Please attend the exercise class to which you have been assigned.**
- The instructor will present the starred problems in class.
- You should then work on the other problems on your own.
- The instructor and helper will be available for questions.
- Solutions will be available online by Friday after 5pm.
- This problem set complements the web-based coursework (which deals with more routine problems). Although the tutorial problems are not assessed, they are essential for understanding the lectures and may be relevant to the final exam.

(*) Problem 1: How may the following complex numbers be obtained from $z = x + iy$ geometrically?

$$(a) \bar{z}, \quad (b) -z, \quad (c) (-z), \quad (d) 1/z.$$

Illustrate your answers with a sketch.

(*) Problem 2: Describe the locus of the point z which moves in the complex plane such that

$$|z - i| = 2|z - 1|,$$

using (a) geometrical and (b) algebraic arguments.

Problem 3: Obtain x and y in terms of a and b if

$$\frac{1}{x + iy} + \frac{1}{a + ib} = 1.$$

Problem 4: Express the following complex number in standard Cartesian form $a + ib$ where a and b are real numbers:

$$\frac{(2 + i)^3}{(3 + 4i)^3}$$

You should simplify the numerator and denominator as much as possible.

Problem 5: Graph the points $z = x + iy$ that satisfy the given conditions:

$$(a) |z - 1| = 2, \quad (b) |z + 1| = |z - 1|, \quad (c) |z + 1| \geq |z|.$$