

Course 3423/4 2011-12**S h e e t 1**

Due: after the lecture next Wednesday

Exercise 1

Find θ_1 and θ_2 such that the number

$$\frac{e^{i\theta_1} - 1}{e^{i\theta_2} - 1}$$

is not real.

Exercise 2

Prove the differentiation rules for the formal derivatives:

[(i)] The Leibnitz Rule:

$$(fg)_z = f_z g + f g_z, \quad (fg)_{\bar{z}} = f_{\bar{z}} g + f g_{\bar{z}}.$$

[(ii)] The Chain Rule:

$$(f \circ g)_z = f_w g_z + f_{\bar{w}} \bar{g}_z, \quad (f \circ g)_{\bar{z}} = f_w g_{\bar{z}} + f_{\bar{w}} \bar{g}_{\bar{z}}$$

Exercise 3

Determine whether the function f is holomorphic by calculating $f_{\bar{z}}$ using formulas from the previous exercise:

- (i) $f(z) = \cos(z\bar{z}^5)$;
- (ii) $f(z) = e^{z^2 + \bar{z}}$;
- (iii) $f(z) = \overline{\sin(\bar{z}^2)}$