MT1612: EXAMPLE SHEET[1] III (for Feb. 24, 1999)

1.) Use Euler's theorem to put the following expressions into polar form (using the complex exponential)

(i) $z = -5i$,

(ii) $z = -1 + i$,

(iii) $z = -2 - 2\sqrt{3}\, i$,

(iv) $z = (-\sqrt{2} - \sqrt{2}\, i)^7$.

2.) Using the relations between the complex exponential, sin / cos and sinh / cosh determine the real and imaginary parts of

(i) $e^{2+5\pi i/6}$,

(ii) $\cos(i)$

(iii) $\cosh(\pi i)$

(iv) $\sin(\pi/3 - i)$ [Hint: $\sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta)$].

3.) Use the relations between the complex exponential and sin / cos to

(i) write $\cos^3\varphi$ in the form $a_1 \cos\varphi + a_3 \cos(3\varphi)$,

(ii) write $\sin^4\varphi$ in the form $a_0 + a_2 \cos(2\varphi) + a_4 \cos(4\varphi)$.

4.) Find *all* values of

(i) $\ln(-3)$,

(ii) $\ln(-1 - i\sqrt{3})$.

(iii) What is the principal value of $\ln i$?

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[1] Any feedback to: *M.Heil@maths.man.ac.uk*