Dr Halbeisen*

Modules 110PMA003 & 110PMA107

Department of Pure Mathematics

Week 3, 2001

The pdf-file you may download from
http://www.math.berkeley.edu/~halbeis/4students/zero.html

Please hand in your solutions (stapled together with your full name on the first page) at the lecture on Thursday, 18th of October 2001.

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10. Write the following complex numbers in the form $r \cdot e^{i\varphi}$.

    (a) $(1-i)$ (b) $(-\sqrt{3}-i\sqrt{3})$ (c) $(-\sqrt{3}-i\sqrt{3})^3$ (d) $\big((1-i)\cdot(-\sqrt{3}-i\sqrt{3})\big)^3$

11. Write the following complex numbers in the form $(a+ib)$.

    (a) $\sqrt{2}\cdot e^{i\frac{\pi}{8}}$ (b) $\left(\sqrt{2}\cdot e^{i\frac{\pi}{8}}\right)^4$ (c) $3\cdot e^{i\frac{7\pi}{6}}$ (d) $\Big(\left(3\cdot e^{i\frac{7\pi}{6}}\right)\cdot\left(\sqrt{2}\cdot e^{i\frac{\pi}{8}}\right)\Big)^4$

12. (a) Find all solutions of the equation $z^5 = 1$.

    (b) Find all solutions of the equation $z^3 = -27$.

    (c) Plot the solutions of part (a) and (b) on an Argand diagram.
    Hint: The 5 solutions of part (a) form a regular five-angle and the 3 solutions of part (b) form a regular triangle. Did you get it?

13. Write $\sin(\alpha-\beta)$ and $\cos(\alpha-\beta)$ in terms of $\sin(\alpha), \sin(\beta), \cos(\alpha)$ and $\cos(\beta)$.
    Hint: Use that $e^{i\varphi} = \cos(\varphi) + i\sin(\varphi)$ and remember that for each φ we have $\cos(-\varphi) = \cos(\varphi)$ and $\sin(-\varphi) = -\sin(\varphi)$.

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Office hours (Room 1007): Monday 1 pm–2 pm, Wednesday 2 pm–3 pm