

Math 131A-1: Homework 9

Due: March 6, 2015

1. Read Sections 23, 31-32 in Ross.
2. Do problems 29.2, 29.4, 29.5, 29.13, 29.16, 29.18, 23.1(a),(c),(e),(g), 23.5, and 31.1 in Ross.
3. *The five constants.* Recall that the imaginary number i satisfies the property that $i^2 = -1$. Assume that the power series expansions about zero we have computed for e^x , $\sin x$, and $\cos x$ are valid on complex numbers as well as real numbers. (This is true, but we won't prove it in this class.)
 - (a) What are i^3 and i^4 ? In general, what can you say about i^{4k+j} ?
 - (b) Use the power series expansions for e^x , $\sin x$, and $\cos x$ to show that $e^{ix} = \cos x + i \sin x$ for all $x \in \mathbb{R}$.
 - (c) Put $x = \pi$ into the equation from part to prove that $e^{i\pi} + 1 = 0$. This gives a relationship between our five most basic analytical constants.