1. Do problems 29.5, 29.13, 29.16, 29.18, 23.1(a),(c),(e),(g), 23.5 [You are welcome to cite Theorem 12.1], 31.1, 31.4 in Ross.

2. 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 (b) to prove that $e^{i\pi} + 1 = 0$. This gives a relationship between our five most basic analytical constants.