
1. From the textbook, solve 2.10.2, 2.10.5, 2.10.9, 2.10.12.

2. Problems 3.1.2, 3.1.5(a), 3.1.6, 3.1.7, 3.1.10, 3.1.11, 3.1.19(a).

3. Recall the Taylor expansion
   \[ e^z = 1 + z + \frac{z^2}{2!} + \frac{z^3}{3!} + \ldots \]
   (i) Formally substitute \( z = iy \) and find the Taylor expansion of \( e^{iy} \).
   (ii) Find the Taylor expansions of \( \cos y \) and \( \sin y \).
   (iii) Prove that
   \[ e^{iy} = \cos y + i \sin y \]
   and derive that \( e^z = e^x(\cos y + i \sin y) \) as stated in class.
   (iv) We showed in class that \( z \to w = e^z \) is locally invertible. Write down an inverse for the exponential valid in a neighborhood of \( w = \frac{\pi i}{7} \). Where is the local inverse (the logarithm) defined?