Section 2.2: 8

Section 2.3: 5, 10

Additional problems:

- **1.** Express the following functions of z in the form u(x, y) + iv(x, y).
 - (a.) $\sin z$ (hint: first express $\sin z$ in terms of $e^{\pm iz}$.)
 - (b.) $z^2 + \overline{z}^2$
 - (c.) $z e^{-z}$
 - (d.) $|z|^2$

2. For each function in problem 1 check whether the Cauchy-Riemann equations are satisfied.

3. For $\log z$ any branch of the logarithm, use the chain rule and the relation $e^{\log z} = z$ to give another derivation of $(\log z)'$ off its cut-line (you may assume the branch of $\log z$ is analytic off the cut-line).