I. Section 5.1: 2(b, d), 7(b, c, e), 14(b), 20, 21

II. Section 5.3: 2, 4, 5(d), 6, 10

III. Section 5.5: 2, 9, 12

IV. Section 5.6: 1(a, d, h), 2, 12, 13, 15

V. In the class, we showed that

If a power series $\sum_{k=0}^{\infty} a_k z^k$ converges at a point $z_1 \neq 0$, then it also converge at any point in the open disk $\{z : |z| < |z_1|\}$.

Show that the following stronger statement is valid:

If a power series $\sum_{k=0}^{\infty} a_k z^k$ converges at a point $z_1 \neq 0$ and $R'$ is a positive real number strictly smaller than $|z_1|$, then the power series converges uniformly on the closed disk $\{z : |z| \leq R'\}$.

[HINT: Follow the proof of the first statement and modify it appropriately.]
[REMARK: Observe that these two statements essentially prove Theorem 5.3.7.]

VI. [NOTE: We have not covered the prerequisites for this problem but you may still want to try it.]

Let $f_1(z), f_2(z), \ldots$ be analytic functions in a disk $D$ and suppose that $f_n(z) \to f(z)$ uniformly in $D$ as $n \to \infty$. Show that $f_n'(z) \to f'(z)$ for every $z$ in $D$.

[HINT: Use Cauchy’s formula and Theorem 5.3.8.]

VI. Section 6.1: 1(a, b, f, h), 2, 3(a, c, e), 4

VII. Section 6.3: 2, 3, 4, 8, 13