1. Exercise 4.14

2. Exercise 4.17

3. Exercise 5.2

4. Exercise 5.5

5. Number theory practice problems:
   (a) Compute $3^{1000} \mod 100$ by hand.

   (b) Compute $[101^{4,800,000,023} \mod 35]$ by hand.

   (c) Let $N = pq$ be a product of two distinct primes. Show that if $\phi(N)$ and $N$ are known, then it is possible to compute $p$ and $q$ in polynomial time.

   $Hint$: Derive a quadratic equation (over the integers) in the unknown $p$.

   (d) Let $N = pq$ be a product of two distinct primes. Show that if $N$ and an integer $d$ such that $3 \cdot d \equiv 1 \mod \phi(N)$ are known, then it is possible to compute $p$ and $q$ in polynomial time.

   $Hint$: Obtain a small list of possibilities for $\phi(N)$ and then use the previous exercise.