1. Do Exercise 3.1(c). This problem amounts to determining the coefficients $c_k$ in (3.28).

2. Do Exercise 3.4, parts (a) and (b). You may take as a starting point that (formal) general solution of the PDE plus BCs is
$$u(x, t) = \sum_{k=1}^{\infty} c_k e^{-k^2 \pi^2 t} \sin(k \pi x).$$

3. Do Exercise 3.5, parts (a) and (b). You may take as a starting point that (formal) general solution of the PDE plus BCs is
$$u(x, t) = \frac{a_0}{2} + \sum_{k=1}^{\infty} a_k e^{-k^2 \pi^2 t} \cos(k \pi x).$$

Note that, by including the factor $1/2$ with the constant $a_0$ we get a single expression for all $a_k$
$$a_k = 2 \int_0^1 f(x) \cos(k \pi x) \, dx$$
instead of the exceptional expression for $c_0$ that is required when we write
$$u(x, t) = \sum_{k=0}^{\infty} c_k e^{-k^2 \pi^2 t} \cos(k \pi x).$$

4. Do Exercise 3.11.


6. Read Exercise 3.14. Does the orthogonality of $\sin(k \pi x)$ with $\cos(m \pi x)$ go against what you found in Exercise 3.5(b)? Why or why not?

7. Do Exercise 3.15.