1. (Chapter 2)
   2.1: 1, 2, 4-6; 2.2: 1, 2; 2.4: 2, 3, 5; 2.5: 2;

   Solve the boundary value problems: \( u_x + uu_y = 0 \): (a) with \( u(x,0) = x \); (b) with \( u(x,0) = -x \).

   Assume that \( x(s,\tau), y(s,\tau), h(s,\tau) \) solves the ODE system (1 - 7), and assume that the map: \( (s,\tau) \to (x,y) \) is 1-1 onto with a \( C^1 \) inverse (on the corresponding domain, assume both are \( R^2 \) here). Show that the function \( u(x,y) = h(s(x,y),\tau(x,y)) \) solves (1 - 1).

2. (Chapter 3 )
   3.1: 1b, 3, 4, 7-9 (not required), 10, 11, 13, 16; 3.2: 3, 4, 6, 7, 15; 3.3: 2-4; 3.4: 6, 7; 3.5: 2, 3.

3. (Chapter 5 )
   5.1: 1, 3, 10, 11; 5.2: 2-6; 5.3: 1-4; 5.4: 1, 3, 7.

   Show the existence and uniqueness of bounded continuous solution for the diffusion problem: \( u_t = au_{xx}, \) for \( t > 0 \) and \( x > 0 \) with the zero boundary \( u(0,t) = 0 \) and the bounded continuous initial value \( u(x,0) = f(x) \) with \( f(0) = 0 \).

4. (Chapter 4 )
   4.1: 2, 8; 4.2: 2, 8, 9 (for the solution of prob. 2); 4.3: 1, 2, 4, 6; 4.4: 1, 2, 4 (n=2).

5. (Chapter 8)
   8.1: 1, 4; 8.2: 1; 8.3: 3, 4; 8.4: 1, 4.