We present methods to study the controllability and the stabilizability of nonlinear control systems. The emphasis is put on specific phenomena due to the nonlinearities. In particular we study cases where the nonlinearities are essential for the controllability or the stabilizability. We illustrate these methods on control systems modeled by ordinary differential equations or partial differential equations (Euler and Navier-Stokes equations of incompressible fluids, Korteweg de Vries equations, Burgers equations, Schrödinger equations)