1. Exercise 5.11. (Hint: $\{\tilde{M}(t)\}$ is a martingale. More importantly, you can check that, for any choice of $\{\Delta(t)\}$, the process $\{D(t)X(t) + \int_0^t D(u)C(u)du\}$ is also a martingale, so

$$D(t)X(t) + \int_0^t D(u)C(u)du = \tilde{E}\left(D(T)X(T) + \int_0^T D(u)C(u)du\right|\mathcal{F}_t).$$

(1)

You are asked to choose a trading strategy $\{\Delta(t)\}$ and a $X(0)$ so that we can have $X(T) = 0$ in (1).

2. Exercise 6.1.

3. Exercise 6.8. (Hint: if for any function $h(y)$, $\int_0^\infty h(y)f(y)dy = 0$, then we must have $f(y) \equiv 0$. The transition density $p(t, T, x, y)$ is defined as

$$p(t, T, x, y)dy = P(X(T) \in dy | X(t) = x).$$

(2)