10.4 (a) Integrate both sides from s to t

$$\begin{aligned} X_t &= X_s + \int_s^t 3\mathrm{d}u + \int_s^t 7\mathrm{d}B_u \\ &= X_s + 3(t-s) + 7\underbrace{(B_t - B_s)}_{N(0,t-s)} \\ X_t|\mathcal{F}_s &\sim N(X_s + 3(t-s), 49(t-s)). \end{aligned}$$

The process X is Markov.
(b)

$$\begin{aligned} X_t &= X_s + \underbrace{\int_s^t 2u\mathrm{d}u}_{t^2-s^2} - \underbrace{\int_s^t u\mathrm{d}B_u}_{N\left(0,\int_s^t u^2\mathrm{d}u\right)} \\ X_t|\mathcal{F}_s &\sim N\left(X_s + t^2 - s^2, \frac{t^3-s^3}{3}\right) \end{aligned}$$

The process X is Markov.
(c) First use the Ito formula to find the SDE for $\ln X$ and then integrate from s to t

$$\begin{aligned} \mathrm{d}\ln X_t &= \left(0.15 - \frac{1}{2}0.2^2\right)\mathrm{d}t + 0.2\mathrm{d}B_t \\ \ln X_t &= \ln X_s + \underbrace{\int_s^t 0.13\mathrm{d}u}_{0.13(t-s)} + \underbrace{\int_s^t 0.2\mathrm{d}B_u}_{N(0,0.04(t-s))} \\ \ln X_t|\mathcal{F}_s &\sim N(\ln X_t + 0.13(t-s), 0.04(t-s)). \end{aligned}$$

This means X_t is distributed lognormally, the mean and variance of the lognormal distribution can be found on page 361 (Section B.12) of the MTF book:

$$X_t|\mathcal{F}_s \sim \log N(X_t\mathrm{e}^{0.15(t-s)}, X_t^2\left[\mathrm{e}^{0.34(t-s)} - \mathrm{e}^{0.3(t-s)}\right]).$$

The process X is Markov.