10.8 The interest rate r_t has a deterministic mean of $0.03+(r_0-0.03)^{-0.8t}$ and a random component with mean zero which represents a sum of uncorrelated, jointly normally distributed shocks. Therefore $\int_0^t \sigma e^{0.8s} dB_s$ is again distributed normally with variance $\int_0^t \sigma^2 e^{1.6s} ds$ (variance of a sum = sum of variances, for uncorrelated variables). In conclusion

$$\begin{aligned} r_t|\mathcal{F}_0 &\sim N\left(0.03+(r_0-0.03)^{-0.8t}, \sigma^2 e^{-1.6t}\int_0^t e^{1.6s} ds\right) \\ &\sim N\left(0.03+(r_0-0.03)^{-0.8t}, \sigma^2\frac{1-e^{-1.6t}}{1.6}\right). \end{aligned}$$