Problem 1.1. (5 points) Write down the definition of the effective interest rate for the time period $[t_1, t_2]$ in terms of the accumulation function $a(\cdot)$.

Solution:

$$i_{[t_1, t_2]} = \frac{a(t_2) - a(t_1)}{a(t_1)}$$

Problem 1.2. (5 points) Write down the definition of the (time-varying) force of interest in terms of the accumulation function $a(\cdot)$.

Solution:

$$\delta_t = \frac{a'(t)}{a(t)} = \frac{d}{dt} \ln(a(t))$$

Problem 1.3. (5 points) SoA Sample FM(DM) Problem #25 Determine which of the following statements concerning risk sharing, in the context of financial risk management, is LEAST accurate.

(a) In an insurance market, individuals that do not incur losses have shared risk with individuals that do incur losses.
(b) Insurance companies can share risk by ceding some of the excess risk from large claims to reinsurers.
(c) Reinsurance companies can further share risk by investing in catastrophe bonds.
(d) Risk sharing reduces diversifiable risk, more so than reducing non-diversifiable risk.
(e) Ideally, any risk-sharing mechanism should benefit all parties sharing the risk.

Solution: (c)

Reinsurance companies issue catastrophe bonds.