

$$f(t) = \begin{matrix} 0.000375 t^2 & \text{for } 0 \leq t \leq 20 \\ 0 & \text{otherwise} \end{matrix}$$

$$\begin{aligned} R(t) &= \int_t^\infty f(\hat{t}) d\hat{t} \\ &= \int_t^{20} 0.000375 \hat{t}^2 d\hat{t} + \int_{20}^\infty 0 d\hat{t} \\ &= \left[\frac{0.000375 \hat{t}^3}{3} \right]_t^{20} = \frac{0.000375}{3} (20^3 - t^3) \end{aligned}$$

$$\begin{aligned} \text{MTTF} &= \int_0^\infty R(t) dt \\ &= \int_0^{20} \frac{0.000375}{3} (20^3 - \hat{t}^3) d\hat{t} \\ &= \frac{0.000375}{3} \left[20^3 \hat{t} - \frac{\hat{t}^4}{4} \right]_0^{20} \\ &= 15 \end{aligned}$$