

Solution for exercise 7.1.3 in Karlin and Pinsky

given is

$$E[W_{N(t)+1}] = E[X_1](M(t) + 1)$$

Using this we can show:

$$\begin{aligned} E[\gamma_t] &= E[W_{N(t)+t} - t] \\ &= E[W_{N(t)+1}] - E[t] \\ &= E[W_{N(t)+1}] - t \\ &= E[X_1](M(t) + 1) - t \end{aligned}$$