Mathematical theory of population genetics

Exercises 10.

1. Calculate in the Moran model (see Lecture notes)

   (a) (4 points) $E[V_i]$

   (b) (4 points) $\sigma^2 = \text{Var}[V_i]$

   where V_i is the number of offspring of the ith individual and $i = 1, \ldots, N$.

2. (6 points) Coalescent times T_i are exponentially distributed (Kingman 1982). Show that the distribution of $T_2/3$ is exponential with parameter $\lambda = 3$. (T_2 gives the time for (the remaining) two lineages to coalesce. See also Lecture notes, the section "Human-neanderthal couples".)