Population Genetics and Molecular Evolution, Week 6: Homework

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Problems

Let's assume a Wright-Fisher model for a population of diploid individuals.
1.1) What is the probability that a new mutation will be transmitted to the next generation when the population has size 2 million and 3 million individuals?
1.2) Please provide the answer for either scenario and explain your answer.

2.1) What is the probability that a new mutation will fix solely due to drift?
2.2) A new mutation has a fixation probability of $\frac{0.1}{N}$. How do you interpret this value? What can you tell about its fitness effect (e.g., beneficial, neutral or detrimental)?
2.3) Under what circumstances can a new mutation have a *relative* fixation probability θ_f very close to 1 (both from the left and from the right)?

3.1) Why do mutations in genes expressed in late life have higher chances to accumulate neutral and nearly neutral variants compared to genes expressed early in life?