

Chapter 4: Solutions to Problems 2, 5

$$2. \quad s_f = 1 - w_{f11} = 0.1$$

$$s_m = 1 - w_{m22} = 0.11$$

$$q_{e.females} = \frac{s_f - 1}{s_f} + \left(\frac{s_m s_f - s_m - s_f + 2}{2s_m s_f} \right)^{\frac{1}{2}}$$

$$q_{e.females} = \frac{0.1 - 1}{0.1} + \left(\frac{(0.11)(0.1) - 0.11 - 0.1 + 2}{2(0.11)(0.1)} \right)^{\frac{1}{2}} = 0.0479$$

$$q_{e.males} = \frac{1}{s_m} + \left(\frac{s_m s_f - s_m - s_f + 2}{2s_m s_f} \right)^{\frac{1}{2}}$$

$$q_{e.males} = \frac{1}{0.11} + \left(\frac{(0.11)(0.1) - 0.11 - 0.1 + 2}{2(0.11)(0.1)} \right)^{\frac{1}{2}} = 0.0431$$

$$\frac{s_f}{1 - s_f} > s_m > \frac{s_f}{1 + s_f} \quad \frac{0.1}{1 - 0.1} > 0.1 > \frac{0.1}{1 + 0.1}$$

$$0.1111 > s_m > 0.0909$$

Therefore, the conditions for a stable equilibrium are met.

$$5. \quad p_1' = \frac{1}{2}P_{12} + \frac{1}{2}P_{13} = P'_{23}$$

$$P_{12}' = \frac{1}{2}(1 - P_{12})$$

$$p_{1t_0} = \frac{1}{2}(0.2) + \frac{1}{2}(0.5) = 0.35$$

$$p_{2t_0} = \frac{1}{2}(0.2) + \frac{1}{2}(0.3) = 0.25$$

$$p_{3t_0} = \frac{1}{2}(0.5) + \frac{1}{2}(0.3) = 0.40$$

$$P_{12t_1} = \frac{1}{2}(1 - 0.2) = 0.40$$

$$P_{13t_1} = \frac{1}{2}(1 - 0.5) = 0.25$$

$$P_{23t_1} = \frac{1}{2}(1 - 0.3) = 0.35$$

$$p_{1t_1} = \frac{1}{2}(0.40) + \frac{1}{2}(0.25) = 0.325$$

$$p_{2t_1} = \frac{1}{2}(0.40) + \frac{1}{2}(0.35) = 0.375$$

$$p_{3t_1} = \frac{1}{2}(0.25) + \frac{1}{2}(0.35) = 0.30$$

$$P_{12t_2} = \frac{1}{2}(1 - 0.4) = 0.30$$

$$P_{13t_2} = \frac{1}{2}(1 - 0.25) = 0.375$$

$$P_{23t_2} = \frac{1}{2}(1 - 0.35) = 0.325$$

$$p_{1t_2} = \frac{1}{2}(0.30) + \frac{1}{2}(0.375) = 0.3375$$

$$p_{2t_3} = \frac{1}{2}(0.30) + \frac{1}{2}(0.325) = 0.3125$$

$$p_{3t_3} = \frac{1}{2}(0.375) + \frac{1}{2}(0.325) = 0.35$$