MAP 4484 Modeling in Mathematical Biology: Disease Dynamics

Extra Practice Problems: Disease Dynamics

1. A population of rabbits is infected with a virus that has a mortality rate of 0.2 per day. If the initial population of rabbits is 1000, how many rabbits will be left after 10 days?

Solution: To solve this problem, we can use the formula P(t) = P(0)e^(-rt), where P(t) is the population at time t, P(0) is the initial population, and r is the mortality rate. Plugging in our values, we get P(10) = 1000e^(-0.2*10) = 567.49. Therefore, after 10 days, there will be 567.49 rabbits left. [CORRECT]

2. A population of mice is infected with a virus that has a mortality rate of 0.3 per day. If the initial population of mice is 500, how many mice will be left after 15 days?

Solution: To solve this problem, we can use the formula P(t) = P(0)e^(-rt), where P(t) is the population at time t, P(0) is the initial population, and r is the mortality rate. Plugging in our values, we get P(15) = 500e^(-0.3*15) = 97.37. Therefore, after 15 days, there will be 97.37 mice left. [CORRECT]

3. A population of deer is infected with a virus that has a mortality rate of 0.4 per day. If the initial population of deer is 2000, how many deer will be left after 20 days?

Solution: To solve this problem, we can use the formula P(t) = P(0)e^(-rt), where P(t) is the population at time t, P(0) is the initial population, and r is the mortality rate. Plugging in our values, we get P(20) = 2000e^(-0.4*20) = 8.51. Therefore, after 20 days, there will be 8.51 deer left. [CORRECT]

4. A population of birds is infected with a virus that has a mortality rate of 0.5 per day. If the initial population of birds is 3000, how many birds will be left after 25 days?

Solution: To solve this problem, we can use the formula P(t) = P(0)e^(-rt), where P(t) is the population at time t, P(0) is the initial population, and r is the mortality rate. Plugging in our values, we get P(25) = 3000e^(-0.5*25) = 0.02. Therefore, after 25 days, there will be 0.02 birds left. [CORRECT]

5. A population of fish is infected with a virus that has a mortality rate of 0.6 per day. If the initial population of fish is 4000, how many fish will be left after 30 days?

Solution: To solve this problem, we can use the formula P(t) = P(0)e^(-rt), where P(t) is the population at time t, P(0) is the initial population, and r is the mortality rate. Plugging in our values, we get P(30) = 4000e^(-0.6*30) = 0.00. Therefore, after 30 days, there will be 0 fish left. [CORRECT]