**I\_mig Thinking/Proof**

*Method 1:* Assume there is migration into the general population at rate “m”.

Therefore,

Let’s solve for t=0

We also know that N(0) = N0, meaning that

And our final equation is

Now, we would like to know the total number of migrants that are infected. All migrants are either infected or susceptible. The probability that any given migrant is infected is . Because this is a deterministic model, we can assume that the probability a migrant is infected actually represents an accurate proportion of infected migrants. For example, if the probability a migrant is infected is and there are ten migrants, three migrants will be infected in our deterministic model. Therefore, N(t) can be written as

Since we assume no infected individuals to begin with, we can define the number of infected individuals in the population as

To calculate the number of infected individuals who enter the population in a given day, let’s examine the change between t=0 and t=1

Thus in the paper, Imig can be represented as

*Method 2*: In our population, people immigrate and emigrate at rates m1 and m2

Solving for t = 0, where N(0) = N (here, N is a constant)

Let’s calculate the change in N over a day

We want to calculate the number of infected people who enter N on a given day, so first let’s assume that no one is leaving our population. Therefore, we set m\_2 = 0.

Now, we know that people who enter the population (at rate m\_1), are infected with probability

We assume that m\_1 = m, so