Exercise 3: Spatial heterogeneity

SIR model with spatial variation

Using your SIRS model from exercise 2 (treatment model 2),

1. Duplicate the 4 compartment model to create a second population/patch using initial values S1=900, I1=20, T1=10, R1=70, S2=900, I2=20,T2=10, R2=70. Make use of the following parameters:

beta=0.4, effective contact rate

r=1/7, drug therapy cure rate

p=1/50, loss of immunity rate

mu=1/100, birth/death rate

ppi=0.3, probability of receiving treatment

a=1/50, natural cure rate.

b. Incorporate physical movement between the two patches at a rate of m=1/20 days.

c. Explore the impact of movement on the two patch model if

i. beta=0.1 in Patch 2

ii. ppi = 0.6 in Patch 1

iii. I2=T2=0, S2=1000, in Patch 2