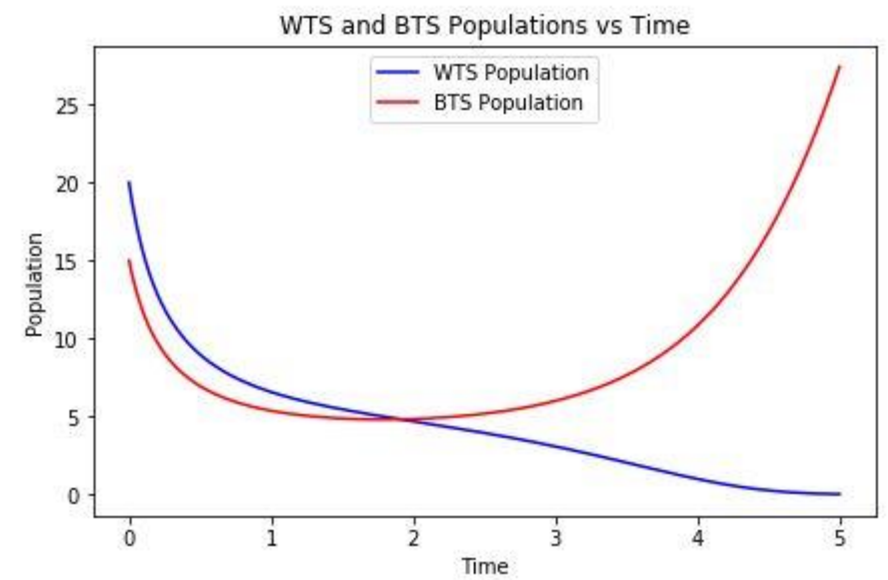
Q#01:

A: INITIAL POPULATION AND POPULATION EXTINCT:



The initial population is

WTS:20

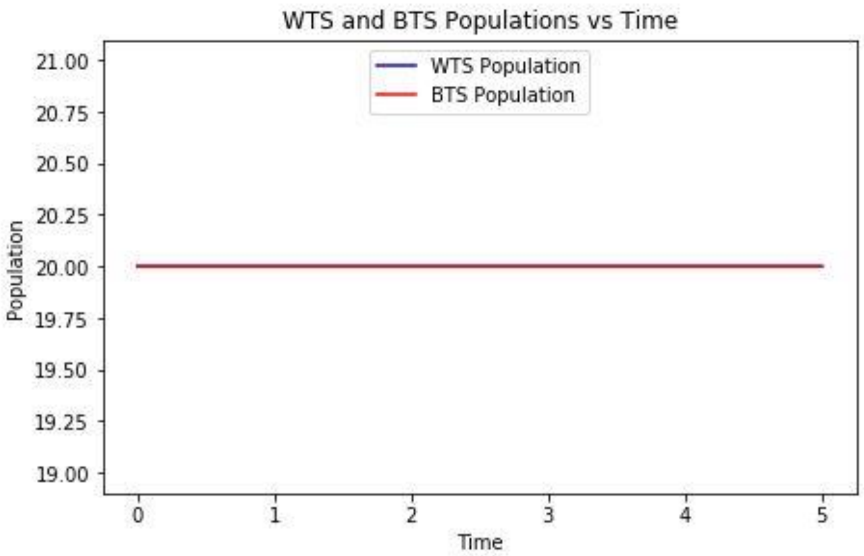
BTS:15

After some time, the line with blue color is touching the axis this mean the White tip shark represented by the blue line will get finished.

B: EQULLIBRIUM

The equilibrium position will be achieved by fixing values to 0 (Such as birth rate, death rate, fractions).

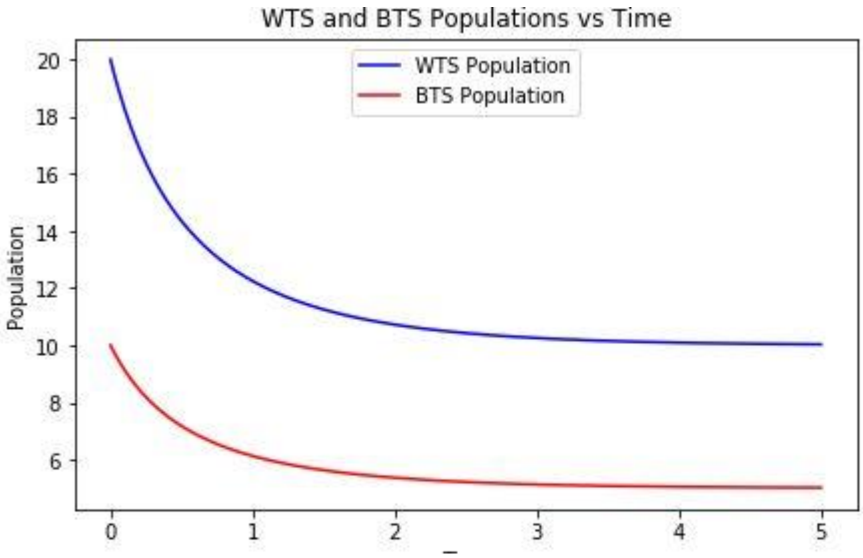
```
show()
```




```
WTS_population = 20
BTS_population = 20

WTS_birth_fraction = 0
WTS_death_proportionality_constant = 0
WTS_births = WTS_population * WTS_birth_fraction
WTS_deaths = (WTS_death_proportionality_constant * BTS_population)

BTS_birth_fraction = 0

BTS_death_proportionality_constant = 0
BTS_births = BTS_birth_fraction * BTS_population
BTS_deaths = (BTS_death_proportionality_constant * WTS_population)*
```

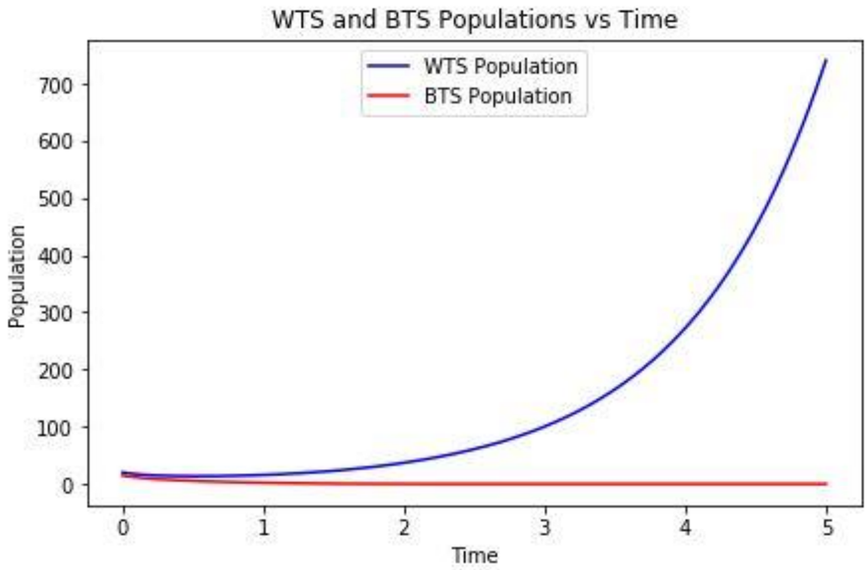
C: ADJUCTING PARAMETER SEVERAL TIMES

Ist time:




```
WTS_population = 20
BTS_population = 10

WTS_birth_fraction = 1
WTS_death_proportionality_constant = 0.2
WTS_births = WTS_population * WTS_birth_fraction
WTS_deaths = (WTS_death_proportionality_constant * BTS_population) * WTS_population

BTS_birth_fraction = 1

BTS_death_proportionality_constant = 0.1
BTS_births = BTS_birth_fraction * BTS_population
BTS_deaths = (BTS_death_proportionality_constant * WTS_population)*BTS_population

tLst = [t]
WTSLst = [WTS_population]
BTSLst = [BTS_population]
for i in range(1, numIterations):
```

2^{ND} TIME:



D: CARRYING CAPACITY

The carrying capacity can be set by limiting the population up to some extent. Or limiting the resources (Area, food etc.)

Q#02

Let:

Predator = Fox and Prey = Rabbits

Prey Population:

Unconstraint population

$$\Delta R = K_R R(t - \Delta t) * \Delta t$$

Constraint Population

$$= \Delta R \propto F(t - \Delta t) * R(t - \Delta t).$$

$$= \Delta R = K_R R(t - \Delta t) - K_{FR} F(t - \Delta t) * S(t - \Delta t) \; \Delta t \rightarrow (1)$$

Predator Population

$$\Delta F = K_F F(t - \Delta t) * \Delta t$$

Constraint Population

$$\Delta F \propto F(t - \Delta t) * R(t - \Delta t).$$

$$\Delta F = K_{RF} * F(t - \Delta t) * R(t - \Delta t)$$

$$K_{RF} (t - \Delta) * \Delta t \rightarrow (2)$$

Differential

$$\frac{dR}{dt} = K_R R - K_{FR} FR \rightarrow \text{Prey}$$

$$\frac{dF}{dt} = K_{RF} RF - K_F F \Rightarrow \text{Predatio}$$

EQUILLIBRIUM:-

These equation or graph will be in equillibrium when

$$\frac{dR}{dt} = K_R R - K_{FR} FR = 0$$

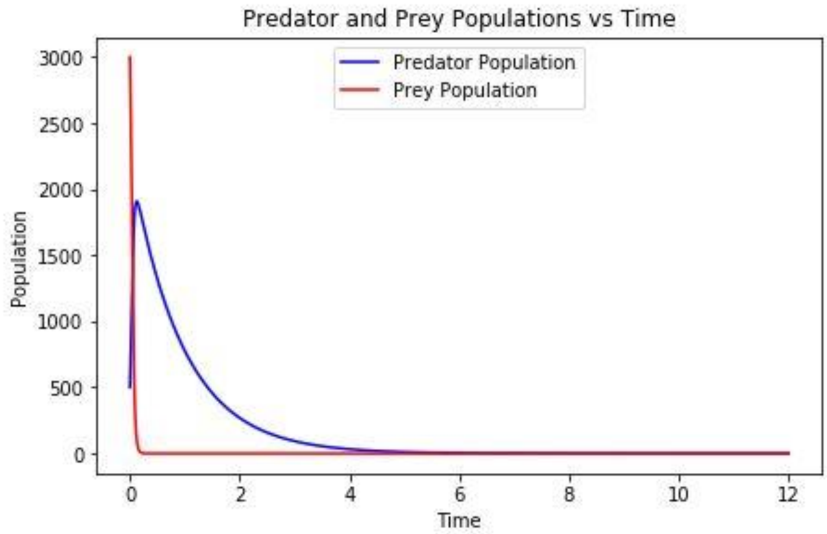
$$\frac{dF}{dt} = K_{RF} RF - K_F F = 0$$

if both equation are equalt to zero then graph of population will be in equillibricum

Predator=500 and Prey=3000

```
predator_population = 500
predator_birth_fraction = 0.01
predator_death_proportionality_constant = 1.06
prey_population = 3000
prey_birth_fraction = 2
prey_death_proportionality_constant = 0.02

predator_births = (predator_birth_fraction * prey_population) *
predator_deaths = predator_death_proportionality_constant * pre
```

Equilibrium:



Q#03

Predator with CARRYING CAPACITY.

$$\frac{dx}{dt} = x\left(1 - \frac{x}{K}\right) - \frac{axy}{1+chx}$$

$$\frac{dy}{dt} = \frac{bxy}{1+chx} - dy$$

Here

"k" = predator with carrying capacity

a = food intake of predator

b = " " " prey.

x, y density of prey and predator.

Q#04