Week 1- Solving the Des

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```
# defining model parameters

# initialized params and state variables here ... these are fixed nnonetheless
alpha.0 = 1/3; beta.0 = 0.5; N.0=7900000; prop.val <- FALSE

S.0 = 7900000; I.0 = 10; R.0 = 0

# alpha: recovery rate, beta: contacts per given time sufficient for spread
params <- c(alpha = alpha.0, beta = beta.0, N=N.0)

# state variables
if(prop.val){
  state <- c(S = S.0/N.0, I=I.0/N.0, R = R.0/N.0)
}else{
  state <- c(S = S.0, I=I.0, R = R.0)
}
```

```
# function to return the rates of change

RateOfChange <- function(t, state, params)
{

  # convert the rates into named list
  with(as.list(c(state, params)), {

    # rate of change of subsceptible population
    dS <- -beta*(S/N)*I
    # rate of change of the infectious population
    dI <- beta*(S/N)*I - alpha*I
    # rate of change of the recovered population
    dR <- alpha*I

    # return the rate of change
    list(c(dS, dI, dR))

  })

}
```

```
# run the model
```

```r
times <- seq(0, 150, by = 1)
out <- ode(y = state, times = times, func = RateOfChange, parms = params)
head(out)
```

```
##      time       S        I         R
## [1,]    0 7900000 10.00000  0.000000
## [2,]    1 7899995 11.81360  3.627207
## [3,]    2 7899988 13.95611  7.912247
## [4,]    3 7899981 16.48719 12.974419
## [5,]    4 7899972 19.47728 18.954660
## [6,]    5 7899961 23.00964 26.019469
```

```r
# make a combine plot
dat <- data.frame(out)
ggplot(data = dat, aes(time)) + geom_line(aes(y = S, colour = "blue")) +
  geom_line(aes(y = I, colour = "red")) +
  geom_line(aes(y = R, colour = "green"))
```