1. $N(t) = N(0)e^{rt}$

$$\frac{\ln[N(t)/N(0)]}{r} = t$$

$N_t \sim 100$

$$\frac{\ln[100/10]}{0.1} = t$$

$t = 23.0$ days

$N_t \sim 1000$

$$\frac{\ln[1000/10]}{0.1} = t$$

$t = 46.1$ days

$N_t \sim 100{,}000{,}000$

$$\frac{\ln[100{,}000{,}000/10]}{0.1} = t$$

$t = 161.2$ days

$N \sim 1 \times 10^{11}$

$$\frac{\ln[1\times10^{11}/10]}{0.1} = t$$

$t = 230.3$ days

The ability of the lice population to grow so rapidly is fairly surprising, but less so when I consider that this kind of growth would only occur under extremely favorable circumstances in which resources are completely unlimited.

2. $N_t = N_0 e^{rt}$

$13.8^{8} \times 10^{9} = 6.9 \times 10^{9} e^{r\,41}$

$2 = e^{r\,41}$

$\ln 2 = \ln e^{r\,41}$

$\ln 2 = 41r$

$\frac{\ln 2}{41} = r$

$r = 0.017$

3. $T_d = \frac{0.69}{r}$ $r = 0.12$

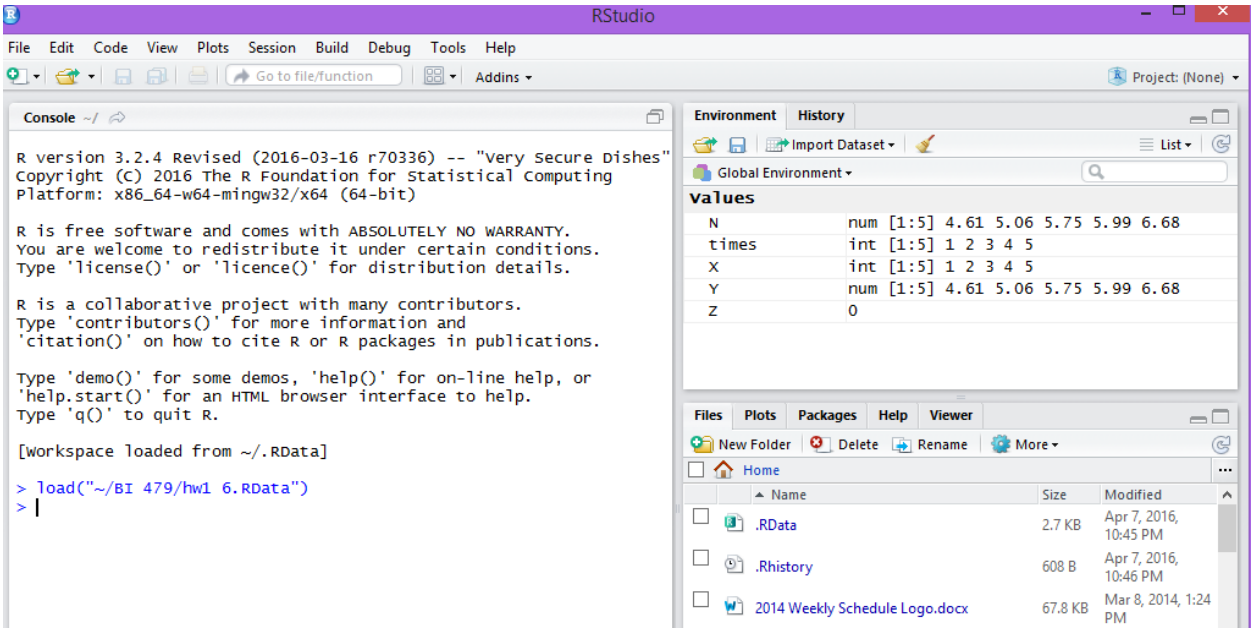
$T_d = 5.75$ years

4. The top 3 causes of death listed by the CDC are health-related in the US. These are heart disease, cancer, and chronic lower respiratory disease. Since health is on an individual basis, I think this is why we can say the death rate is density-independent.

Possible mechanisms which could have an impact on human death rates could be increased incidence of lethal car accidents as the chance for an accident increases with an increase in population. Another mechanism could be an increase in homicides as deaths go up with an increase in population having it be possibly density-dependent.

A third mechanism of death in the US according to the CDC is influenza/pneumonia. While this is health-related, unlike the top 3, this one is much more contagious. As population density increases, the # of people who could get infected goes up potentially increasing the death-rate.

6.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N num [1:5] 4.61 5.06 5.75 5.99 6.68
times int [1:5] 1 2 3 4 5
X int [1:5] 1 2 3 4 5
Y num [1:5] 4.61 5.06 5.75 5.99 6.68
Z 0
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