HW1 - SARAH WARD

① $\frac{\ln[N(t)/N(0)]}{r} = t$

$N(0) = 10 \quad r = 0.1 \quad N(t) = 100$
1000
$100\,000\,000$
$100\,000\,000\,000$

$t = \frac{\ln[100/10]}{0.1} = \boxed{23.026}$ when $N(t) = 100$

$t = \frac{\ln[1000/10]}{0.1} = \boxed{46.052}$ when $N(t) = 1000$

$t = \frac{\ln[100\,000\,000/10]}{0.1} = \boxed{161.181}$ when $N(t) = 100{,}000{,}000$

$t = \frac{\ln[100{,}000{,}000{,}000/10]}{0.1} = \boxed{230.259}$ when $N(t) = 100{,}000{,}000{,}000$

Not surprising, it takes 2x the time to increase by a factor of 10^2 than it takes for the population to increase by a factor of 10^1.

Population of $10^{10} = 10t$ if t is time it takes to increase by a factor of 10^1
eg. exponential growth.

② $\frac{\ln[N(t)/N(0)]}{r} = t, \quad t = 50 \quad N(50) = 2N(0) \quad N(0) = 6{,}900{,}000{,}000$

$r = \frac{\ln[2N(0)/N(0)]}{t} = \frac{\ln[N_{(0)}]}{t} = \frac{\ln[6900000000]}{50} = 0.453$

OVER

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

so, $t = 41$ $N(0) = 6900000000$ $r = 0.453$

$N(41) = 6900000000 \cdot e^{[(0.453)(41)]}$

$= (6900000000)(1164531960.0960)$

$N(41) = \boxed{8.0352705 \times 10^{17}}$

③ $N_T = N_0 \cdot \lambda^T$ $\lambda = 1.12$ $N_T = 2N_0$ $T = ?$

$\frac{N_T}{N_0} = \lambda^T$

$\ln\left(\frac{N_T}{N_0}\right) = T \ln \lambda$

$T = \frac{\ln\left(\frac{N_T}{N_0}\right)}{\ln \lambda}$ $T = \frac{\ln\left(\frac{2N_0}{N_0}\right)}{\ln(1.12)} = \frac{\ln(2)}{\ln(1.12)} = \frac{0.693147}{0.113329}$

$T = 6.1162$ years (approx. doubling time)

④ • human death rate in Eugene is not significantly density dependent. There is enough space & enough resources that as of now, the average causes of death are not a direct result of population density.

- flu season – ↑people = ↑rate of transmission = ↑likelihood of death as a result
- vehicle accidents – ↑people = ↑ veniles = ↑higher rate of accidents = ↑ likelihood of death
- air pollution – ↑people = ↑industry = ↑air pollution = ↑ rate of death caused by pollution

⑤ Apple flea weevils (Rhynchaeus pallicornis)

1 generation/year = discrete. This organism only produces once per year. It emerges in early spring, breeds, lays its larvae in leaves of apple trees, and enters diapause in August or September.