Begin by working the HW problems assigned in WeBWorK. Some of those questions ask for graphs and written explanations (usually noted "In your Lab report...", so you will need to include that information in your HW assignment turned in with the problem below. **All answers need to be written in a clear, succinct manner.** Write a brief paragraph summarizing the answers to the problems with each answer clearly stated in a sentence. Supporting graphs should be provided when asked for, but you should not include printouts of spreadsheets. You can create an appendix to a problem, but that should only include significant material to back up your answers.

1. Michael Crichton in the *Andromeda Strain* (1969) states that "A single cell of the bacterium *E. coli* would, under ideal circumstances, divide every twenty minutes... [I]t can be shown that in a single day, one cell of *E. coli* could produce a super-colony equal in size and weight to the entire planet Earth." A single *E. coli* has a volume of about 1.7 μm^3. The diameter of the Earth is 12,756 km, so assuming it is a perfect sphere, determine how long it takes for an ideally growing colony (Malthusian growth) of *E. coli* (doubling every 20 min) to equal the volume of the Earth. Use the discrete Malthusian growth model and include your growth parameter r.