# Homework 3

## Math 469 (section 500), Spring 2019

This homework is due on Thursday, January 31.

1. Consider a colony of bacteria such that, at each time point, half the population divides, and exactly 200 bacteria die. Write down a difference equation that describes this.

2. (a) Find the difference equation for which the general solution is $X_t = c_1 5^t + c_2(-2)^t$, where $c_1, c_2 \in \mathbb{R}$.

   (b) Consider the sequence $X_t = 5^t + 3t(5)^t$. Determine the difference equation for which $X_t$ is a solution, and the corresponding initial values.

3. Section 1.8 #3, 4, 5, 7

4. This problem pertains to the article, *Models in biology: accurate descriptions of our pathetic thinking* by Jeremy Gunawardena (BMC Biology 2014), available here:
   `https://doi.org/10.1186/1741-7007-12-29`

   (a) Read pages 1–3. What is the difference between forward and reverse modeling?

   (b) Read the description of one of the three models, and page 10. For the model you picked, what is the main message of the author?

5. Pick a published mathematical biology paper (for instance, from the list on the class `Piazza` site).

   (a) State the title and authors.

   (b) State (in several sentences) the main scientific and/or mathematical question(s) that the paper addresses.

   (c) Does the paper involve forward or reverse modeling (or neither)? Explain.