Exercise #8
MB&B 361/562.
Due: before class on Tuesday, March 26, 2024
Please upload it to the Canvas Box (title: 'LastnameFirstname_ExerciseXX').

1. Using the Monte Carlo code from Lecture 15 (4 points)
(i) Calculate the mean and SD of the final protein concentration (use the 500 points from the 500 simulations) for each of the 4 examples (4 means and v SDs).
(ii) The coefficient of variation of a process (reciprocal of the signal to noise ratio) is
$CV = ¿$ SD/mean.
- Plot $\log(CV)$ against $\log(mean)$ for the 4 examples.
Describe the relationship.
What is the significance of the slope? (hint: compare to "shot noise" described in Wiki).
What is the expected value of the CV in terms of the parameters in the model?

2. (2 points) Calculate the mean and variance of the final protein concentration for 6 other values of the parameters: take the parameters in Example (c) and decrease the degradation rates (α, β) and protein synthesis rate (k) 10-fold and 100-fold.
Add these to your plot.
Please interpret your results?

3. (4 points) Repeat Q1 for the RNA concentrations (instead of protein concentrations).
Interpret your results.