

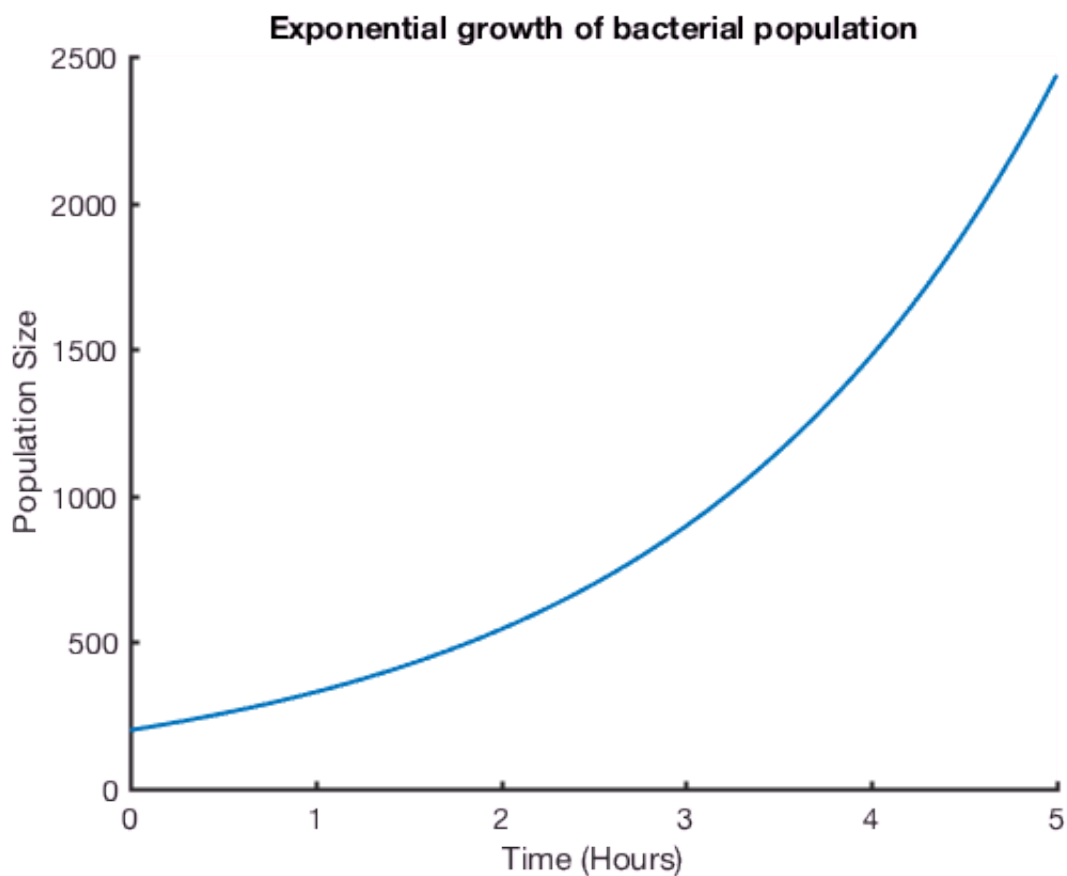
## Problem 1:

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1. Below is the code to generate the growth curve for the first 5 hours

```
x0 = 200; % Initial population size
beta = 0.5; % in 1/hours
t_vector = 0:.1:5; % time vector for plotting in increments of .1 hours
x = x0 * exp(beta * t_vector); % growth as a function of time

figure(1);
plot(t_vector,x,'LineWidth',2);
title('Exponential growth of bacterial population');
xlabel('Time (Hours)');
ylabel('Population Size');
box off
ax = gca;
ax.FontSize = 14;
ax.LineWidth=2;
```



This model is very limited for two main reasons:

- first, it does not consider bacterial death

- second, the growth rate is constant which is not true if nutrients are limited in the environment or if the population is at high density.

2. The doubling time is:

$$t_d = \frac{\ln(2)}{\beta}$$

If you don't know how to use the equation editor you can scan your handwritten equation (or take a picture with your phone) as far as is clearly legible (i.e. good quality):

$$t_d = \frac{\ln(2)}{\beta}$$

The doubling time in this model is independent of the initial condition.

This is an example of a scan or picture with unacceptable quality:

