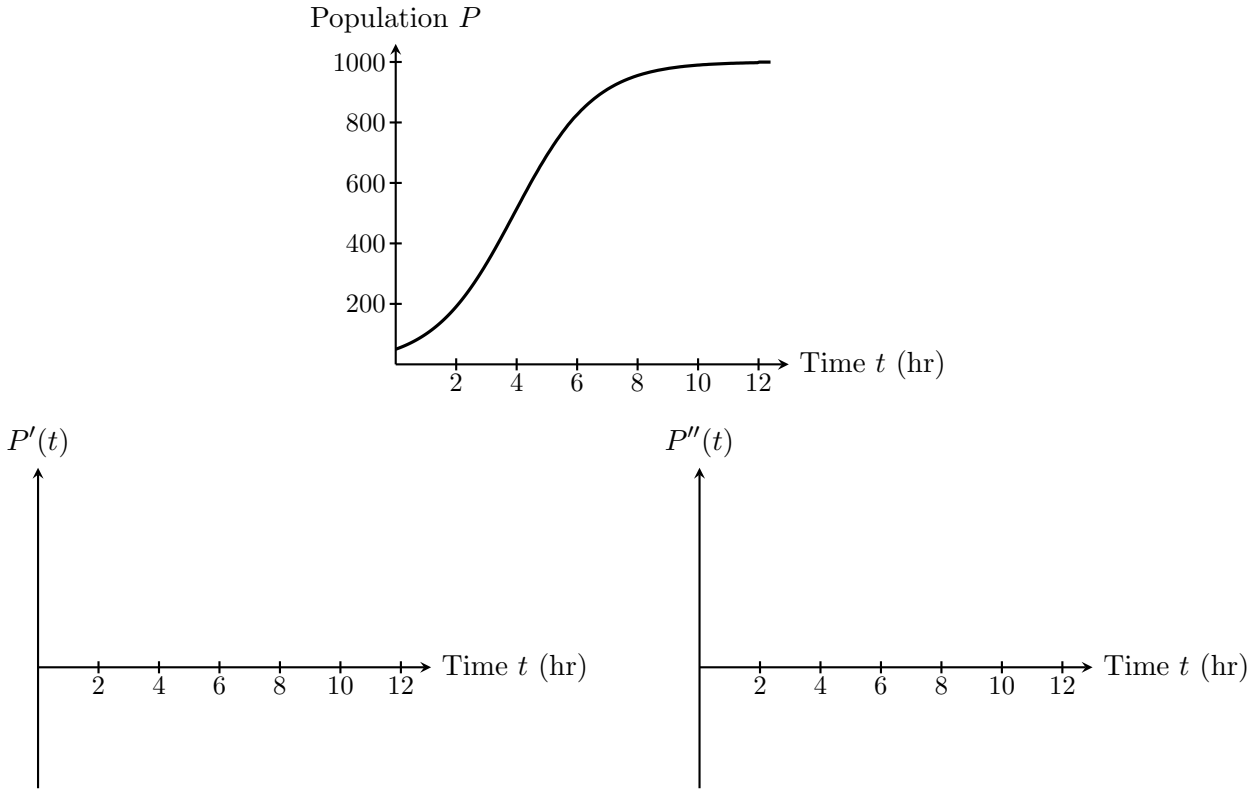
MATH 1450 **Name:**_____

Activity 5

In lecture we've been discussing the definition(s) and meanings of the derivative of a function. Before we jump headlong into computing the derivatives themselves, this activity will hopefully serve as a reminder of why we would want to compute them in the first place. For each of the graphs below, start by graphing the first and second derivatives on the axes shown. Your graphs should clearly indicate where the first derivative is positive/negative and increasing/decreasing, and where the second derivative is positive/negative.

1. The graph below shows the growth of a bacterial colony over time.



(a) What are the units for $P'(t)$? What is its practical meaning in terms of the bacteria colony?

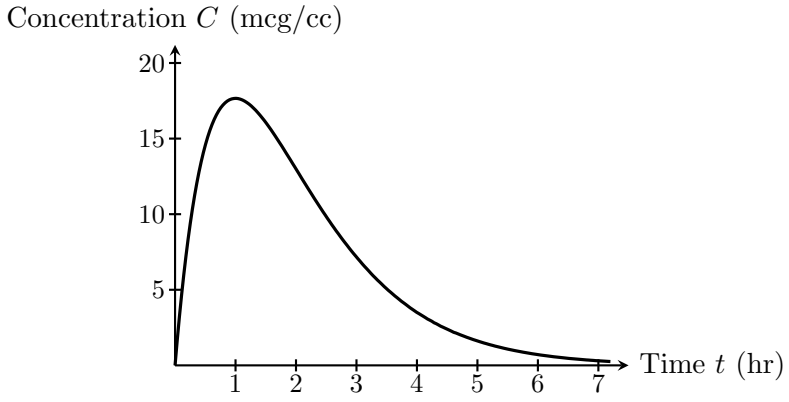
(b) What are the units for $P''(t)$? What is its practical meaning in terms of the bacteria colony?

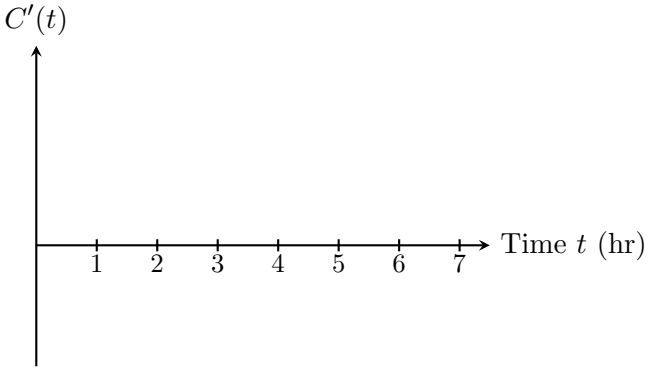
(c) Briefly describe how the population is changing over time.

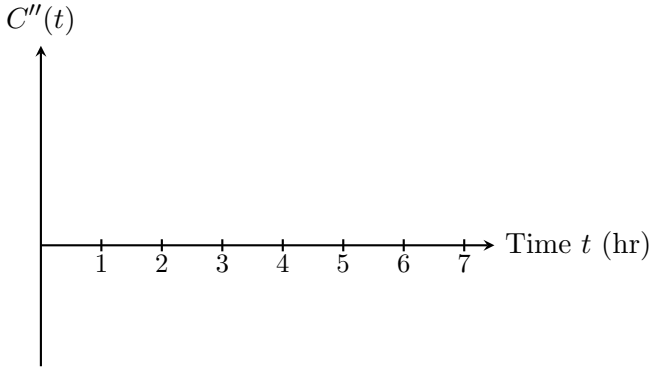
(d) On the graph, mark the points where the population is growing the fastest and the slowest. What do these tell you about the colony?

(e) What might cause the bacteria to grow in this manner?

2. A drug's concentration in a patient's bloodstream is recorded in the graph below.







(a) What are the units for $C'(t)$? What is its practical meaning in terms of the drug in the bloodstream?

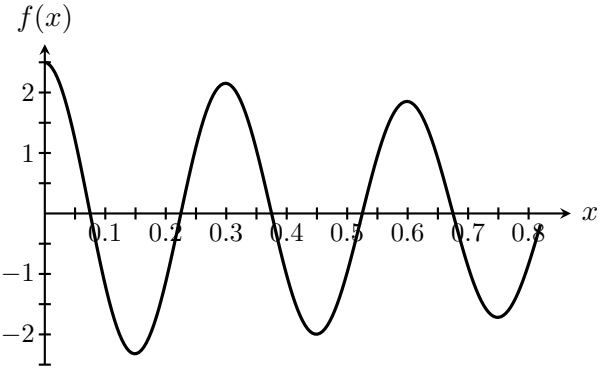
(b) What are the units for $C''(t)$? What is its practical meaning in terms of the drug in the bloodstream?

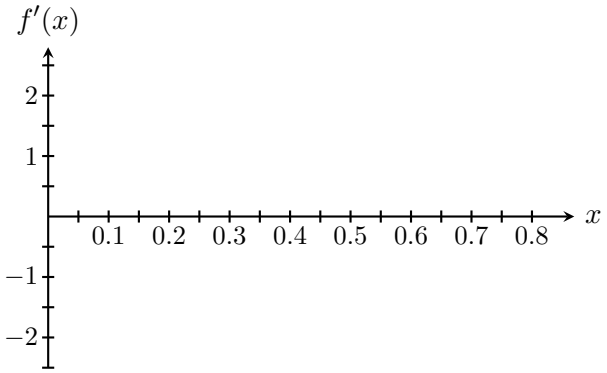
(c) When is the drug at its highest level in the bloodstream? How can you tell?

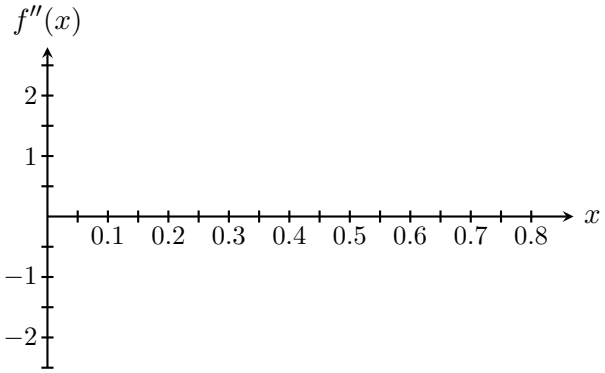
(d) When is the drug being absorbed the fastest? How can you tell?

(e) When do you think the patient is getting the most benefit from the drug? Why?

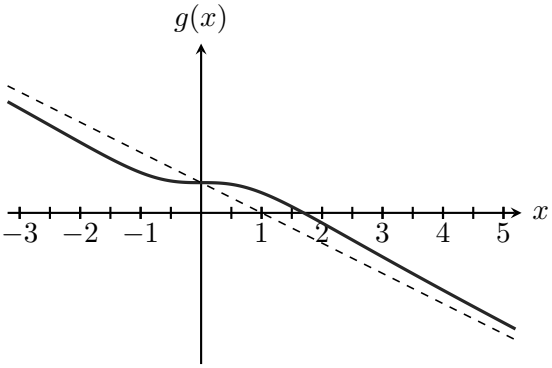
3.

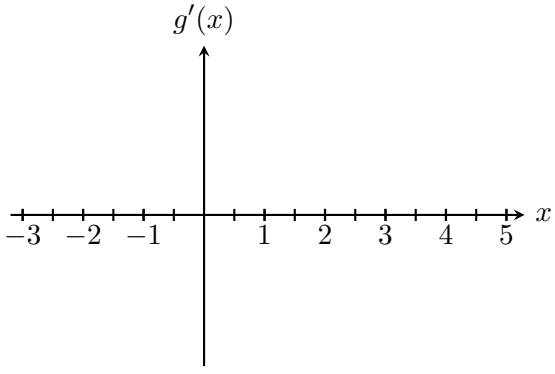

$f(x)$
2
1
−1
−2
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
x

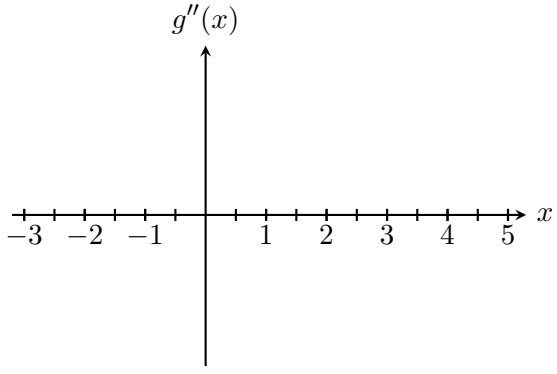

$f'(x)$
2
1
−1
−2
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
x


$f''(x)$
2
1
−1
−2
0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
x

4.


$g(x)$
−3 −2 −1 1 2 3 4 5
x


$g'(x)$
−3 −2 −1 1 2 3 4 5
x


$g''(x)$
−3 −2 −1 1 2 3 4 5
x