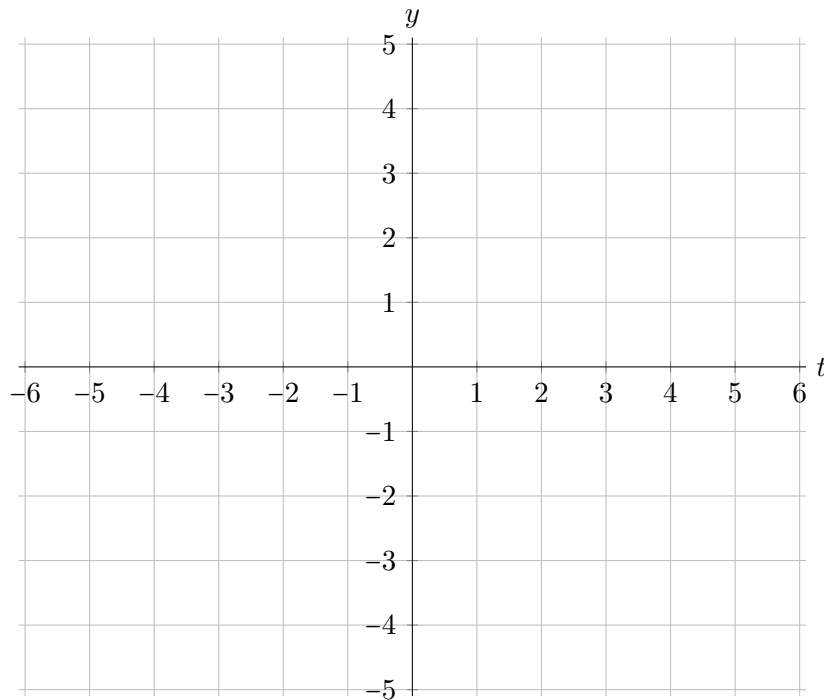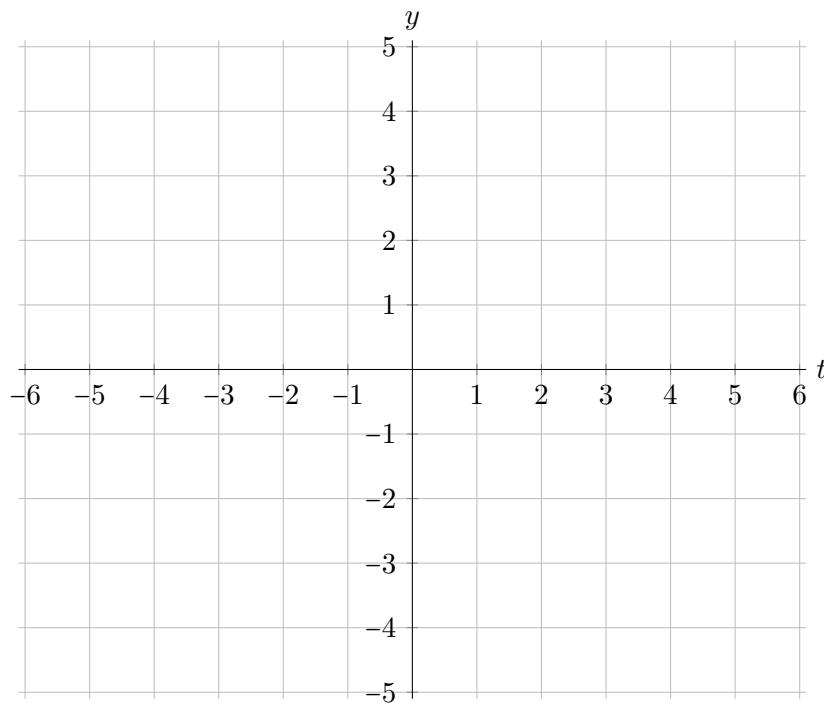**2.** [6 points] For each of the following, sketch a graph of a function meeting the stated criteria, or explain why no such function exists.

a. [3 points] An odd, invertible function defined on the domain $[-6, 6]$

b. [3 points] A periodic function with period 4, amplitude 3, and midline $y = -1$. *Include at least three periods in your sketch.*

3. [15 points] A scientist is observing two different ant colonies under different experimental conditions. From her data, it looks like

- Colony A's population increases by 10% every two hours.
- Colony B's population decreases by 7% every hour.

a. [1 point] By what factor is Colony A's population multiplied each hour? *Give your answer in exact form or rounded to two decimal places.*

a factor of: _____

b. [2 points] What is the *continuous* decay rate of Colony B per hour as a percentage? *Give your answer in exact form or rounded to two decimal places.*

_____ %

c. [2 points] How long will it take for Colony B to reach 25% of its original size? *Show all work. Give your answer in exact form or rounded to two decimal places.*

_____ hours

d. [4 points] If Colony A starts with 1000 ants and Colony B starts with 10,000 ants, after how many hours will the colonies have equal populations? *Show all work. Give your answer in exact form or rounded to two decimal places.*

_____ hours

(Problem continues on the next page.)