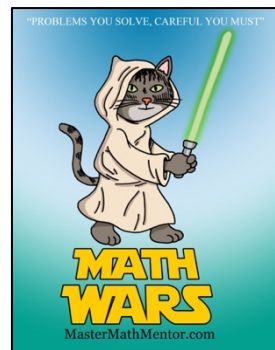


Math Wars – BC Calculus

Topic 206 – Logistic Growth



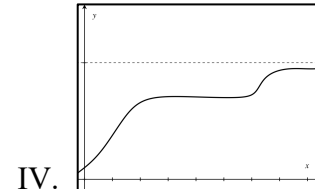
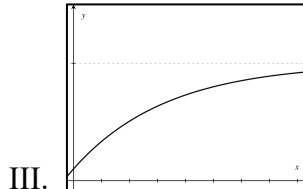
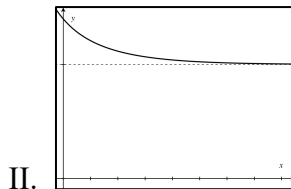
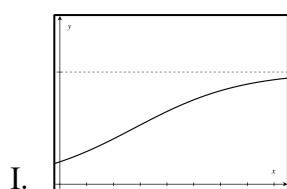
Maximum Time: 9 Minutes

Directions: To start, you need to download the Math Wars application on your cell phone: Use the QR code or the url:

<https://mastermathmentor.com/mmm/mathwars.ashx?key=206>

When ready, start the timer and then solve the problems below, entering your choice, A, B, C, D and pressing **Submit** for each problem when you are sure of your answer. When complete, stop the timer. You will see problems you got correct in green and incorrect in red. You will receive a score based on how many problems you got right and your time. A perfect score is all problems correct using half the maximum time or less. You can text or email your friends with your results.

1. (1 pt) Which of the following graphs could be a section of a curve showing logistic change of population?



- A. I only
C. II and III only

- B. I and II only
D. IV only

2. (3 pts) Which of the following differential equations has a logistic growth curve as a solution?

A. $\frac{dP}{dt} = \frac{1}{8}P^2 - \frac{1}{4}P$

B. $\frac{dP}{dt} = \frac{1}{8}P - \frac{1}{4}P^2$

C. $\frac{dP}{dt} = \frac{1}{4} - P$

D. $\frac{dP}{dt} = \frac{1}{8}P - \frac{1}{4}P^3$

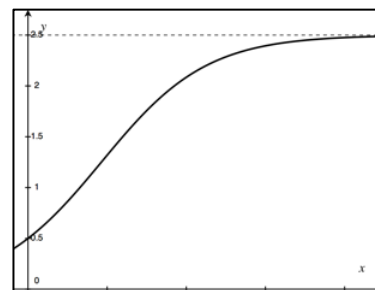
3. (5 pts) The figure to the right shows a graph that is a solution to which one of the following differential equations?

A. $\frac{dy}{dx} = 2x - 5x^2$

B. $\frac{dy}{dx} = 0.6y - 0.3y^2$

C. $\frac{dy}{dx} = 2.5y - y^2$

D. $\frac{dy}{dx} = 1.5y - 0.6y^2$



4. (7 pts) A population is modeled by a function P that satisfies the differential equation $\frac{dP}{dt} = \frac{P}{e} \left(10 - \frac{P}{4e} \right)$. If

$P(0) = 2$, at what value of P does inflection point occur?

A. $20e^2$

B. $5e^2$

C. $20e$

D. $40e$

5. (9 pts) On December 31, Derek makes a resolution to go on a big diet. On January 1, he has already lost 1 pound. The number of pounds P he loses is approximated by the differential equation $\frac{dP}{dt} = 0.03P(40 - P)$ where t is measured in weeks. Approximately what day is he losing weight the quickest if Euler's method with step 1 is used to approximate the solution to the DEQ?

A. January 22

B. January 29

C. February 1

D. February 15