AP Calculus BC Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Pd.\_\_\_

Supplement: Logistic Equations & Euler’s Method Additional Differential Equations Day 4

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| 1. Determine the growth rate, the carrying capacity, find y(t), and y(10). Given  and . | 2. Determine the growth rate, the carrying capacity, find y(t), and y(5). Given  and . |
| 3.  Determine . | 4. Find  If A.)A=15 B.)A=5 C.)A=10 |

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| 5. A population of squirre3ls lives in a forest with a carrying capacity of 2,000. Assume logistic growth with growth constant . |
| A.) Find a formula for the squirrel population P(t), assuming an initial population of 500 squirrels. |
| B.) How long will it take for the population to double? |

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| 6. The population P(t) of mosquito larvae growing in a tree hole increases according to the logistic equation with growth constant  and carrying capacity A=500. |
| A.) Find a formula for the larvae population P(t), assuming initial population  larvae. |
| B.) After how many days will the larvae population reach 200? |

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| 7. Sunset lake is stocked with 2,000 rainbow trout and after 1 year of population has grown to 4500. Assuming logistic growth with a carrying capacity of 20,000, find the growth constant k and determine when the population will reach 10,000. |

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| 8. A rumor spreads through a small town. Let y(t) be the fraction of the population that has heard the rumor at time t and assume that the rate at which the rumor spreads is proportional to the product of the fraction y of the population that has heard the rumor and the fraction  1-y that has not heard the rumor. |
| A.) Write down the differential equation satisfied by y in terms of a proportionality factor k. |
| B.) Find k, assuming 10% of the population knows the rumor at t=0 and 40% knows it 2 days later. |
| C.) Determine when 75% will know. |

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| 9. A rumor spreads though a school with 1,000 students. At 8am, 80 students have heard the rumor and by noon, half the school has heard it. Determine when 90% of the students will have heard it. |

Review Problems

10. If , then 

A. 2xex B. x(x + 2ex) C. xex(x + 2) D. 2x + ex E. 2x + e

11. If  , then 

A.  B.  C.  D.  E. 

Answers:

1. Growth rate = 3, carrying capacity = 5, 
2. Growth rate = 6, carrying capacity = 3, 
3. 2
4. A. 15, B. 5, C. 10
5. A.  B. 1.831 years
6. A.  , B. 5.9725 days
7. Growth constant = .9605; 2.2879 years
8. A.  B. k = .8959 C. 3.6788 days
9. 7.5984 hours
10. C
11. D