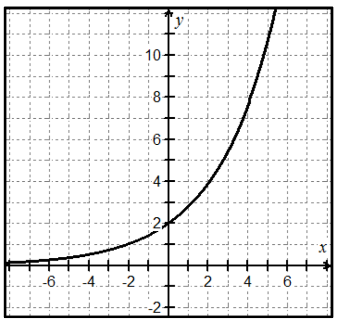
Name ____ Date ____________________ Period ________

3.2 Exponential & Logistic Modeling Homework

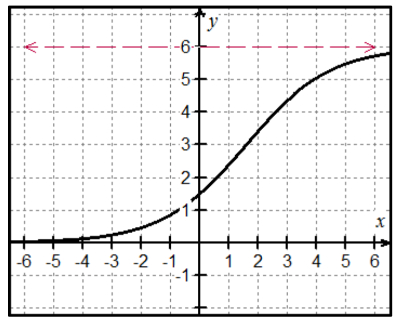
Problems 1 – 4, match the function with its graph. Tell whether it is an exponential growth, exponential decay, or logistic function. Find the constant percentage rate of growth or decay. [The graphs are labeled (A), (B), (C), and (D).]

1. $y = \dfrac{6}{1+3(0.5)^x}$	2. $y = 3e^{-x/2}$
3. $y = 2e^{x/3}$	4. $y = 4e^{\frac{-1}{4}(x-2)^2}$

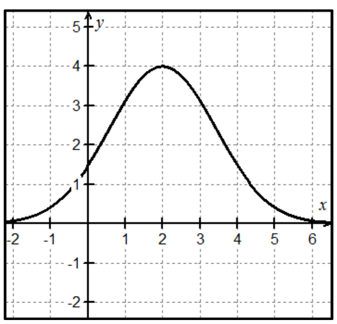
(A)



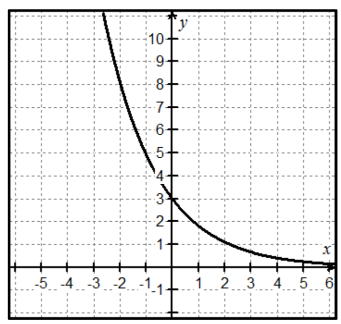
(B)



(C)



(D)



Problems 5 – 8, write an exponential function that satisfies the given conditions.

5. Initial value: 8, increasing at a rate of 16% per year.	6. Initial population: 24,200, decreasing at a rate of 3.4% per year.

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7. Initial height: 41 inches, growing at a rate of 2.7% per month.

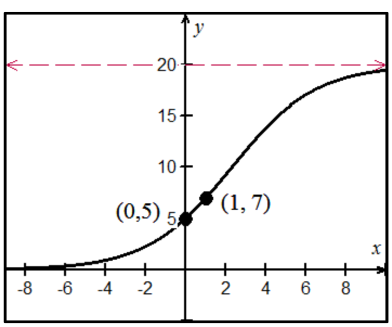
8. Initial mass: 1.3 g, doubling every 4 days.

Problems 9 – 12, write a logistic function that satisfies the given conditions.

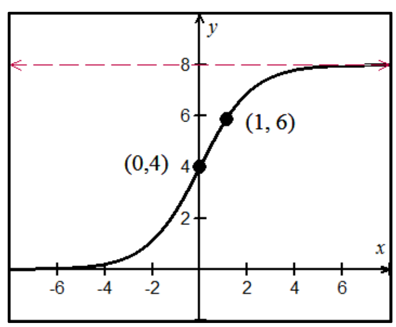
9. Initial value: 28, limit to growth: 62, passing through (1, 36).

10. Initial value: 8, limit to growth: 55, passing through (1, 26).

11.



12.



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Problems 13 – 16, use a graphing utility to graph each function. Find the y-intercept, describe the end behavior using limits.

13. The number N of bacteria in a culture is modeled by $N = 250e^{kt}$, where t is the time in hours. If N = 340 when $t = 4$, find the time required for the population to double in size.

14. When construction on an Interstate highway began, it was necessary to move a population of elk to a protected area. The logistic growth function models the population t years after they were introduced into the new habitat is: $P(t) = \dfrac{650}{1 + 40e^{-0.165t}}$.

A.) How many elk were initially moved to the new habitat?

B.) How many elk will be expected in the new habitat after 10 years?

C.) What is the limiting size of the elk herd that the habitat can sustain?

15. The half-life of a certain radioactive substance is 24 years. A sample has 5.8 grams present initially.

A.) Write a model to express the amount of the substance remaining as a function of time t.

B.) When will there be less than 1 gram remaining?

16. In 1989, a San Francisco construction crew unearthed skeletal remains. It was shown that the skeletons had 88% of the expected amount of carbon-14 that is found in a living person. By using the exponential decay model for carbon-14, predict how old the skeletons were in 1989.
Exponential decay model: $A(t) = A_0 e^{-0.000121t}$

