Date Completed: _____
Mentor Initials: _____

Identifying Linear and Exponential Relationships

1. The coordinates $(1, 7)$, $(2, 14)$, $(3, 28)$, and $(4, 56)$ lie on the xy-plane. What type of function best represents the relationship between these points?

A) Increasing linear
B) Decreasing linear
C) Increasing exponential
D) Decreasing exponential

2. The function $A(t) = 10(2)^{\frac{t}{4}}$ models the number of water hyacinths in a population over time, where $A(t)$ is the number of water hyacinths and t is the time, in days, since the population was first measured. Which is the best interpretation of $(2)^{\frac{t}{4}}$ in this context?

A) The number of water hyacinths doubled t times.
B) The number of water hyacinths doubled every 4 days.
C) The number of water hyacinths increased by 2 every $\frac{t}{4}$ days.
D) The number of water hyacinths increased by 4 every t days.

3. A kid, the offspring of a goat, weighed 7 pounds at birth. The kid is expected to gain about $.5$ pounds every day for the first three months of its life. For this time period, which of the following types of functions best models the weight of the calf as a function of time?

A) Increasing linear
B) Decreasing linear
C) Increasing exponential
D) Decreasing exponential

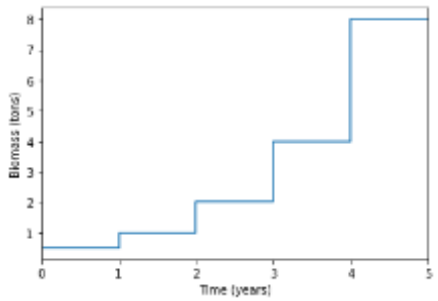
4. $$f(x) = 12.473(1.056)^x$$

The world plastic bag production, in millions of tons, from the years 1865 to 1965 can be modeled by the above function f, where x is the number of years after 1865. According to the model, what is the best interpretation of the value 1.056 in this context?

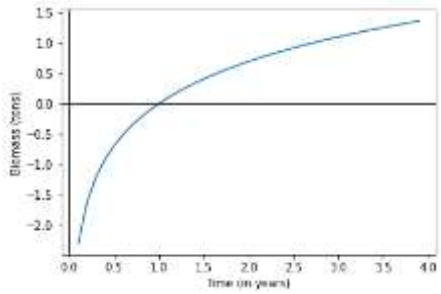
A) On average, the production increased by approximately 0.056 million tons per year.
B) On average, the production increased by approximately 1.056 million tons per year.
C) On average, the production increased by approximately 5.6% per year.
D) On average, the production increased by approximately 105.6% per year.

5. The mass of living organisms in a lake is defined to be the biomass of the lake. If the biomass in a lake doubles each year, which of the following graphs could model the biomass in the lake as a function of time? (Note: In each graph below, O represents $(0,0)$.)

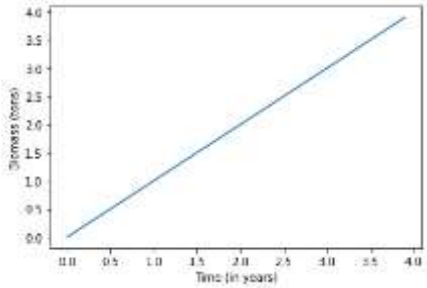
A)



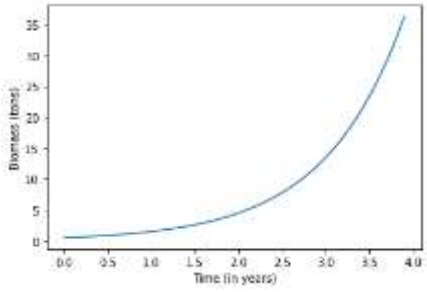
B)



C)



D)



6. The wholesale price of a pound of peanuts decreased by $1.01\$$ from the previous month for five consecutive months. If x is the number of months since the price began to decrease and y is the cost of a pound of peanuts, which of the following equations could model the cost of peanuts over this time period?

A) $y = -1.01x + 1.25$
B) $y = -.99x + 1.25$
C) $y = 1.25(1.01)^x$
D) $y = 1.25(.99)^x$

7. Which of the following is (are) true about the linear function $y = 15 + 3x$ and the exponential function $y = 5(3)^x$?

I. When $x = 0$, the value of the linear function is greater than the value of the exponential function.
II. When $x = 3$, the value of the linear function is greater than the value of the exponential function.

A) I only
B) II only
C) I and II
D) Neither I nor II

8. The function W below gives the estimated weight $W(L)$, in pounds, of a rainbow trout based on its length L, in inches. Which of the following is the best interpretation of the number 1.34 in this context?

$$W(L) = 0.06(1.34)^L$$

A) For each increase of 1 pound in weight, the estimated length of the trout, in inches, increased by 34%.
B) For each increase of 1 inch in length, the estimated weight of the trout, in pounds, increases by 34%.
C) For each increase of 1 pound in weight, the estimated length of the trout increases by 1.34 inches.
D) For each increase of 1 inch in length, the estimated weight of the trout increases by 1.34 pounds.

9. $K = 12{,}000 - 3000t$
$N = 12{,}000(.75)^t$

The given equations are two different models that can be used to find the value, in dollars, of a particular motorcycle t years after it was purchased. Which of the following statements correctly compares the values of K and N for $0 < t < 4$?

A) K is always greater than N.
B) K is always less than N.
C) K is initially less than N but eventually becomes greater than N.
D) K is initially greater than N but eventually becomes less than N.

10. The half-life of the radioactive isotope chromium-51 is approximately 28 days, which means that at the end of each 28-day time interval only half of the mass of the isotope that was present at the beginning of the time interval remains. Which of the following best describes how the amount of chromium-51 changes over time?

A) It increases linearly.
B) It decreases linearly.
C) It increases exponentially.
D) It decreases exponentially.

11. Of the following four types of savings accounts plans, which option would yield exponential growth of the money in the account?

A) Each successive year, 3% of the initial savings is added to the value of the account.
B) Each successive year, 3% of the initial savings and $100 is added to the value of the account.
C) Each successive year, 3% of the current value is added to the value of the account.
D) Each successive year, $100 is added to the value of the account.