Name: _____   Class: _____

Linear / Exponential Functions Day One: Word Problems

<u>Question 1</u>
The population of bacteria in a laboratory is modeled by the function $f(x) = 900 * 3^x$ where x represents weeks.
a. Explain what the 900 represents in the context of the problem

b. Explain what the 3 represents in the context of the problem

c. Find the population of bacteria after 3 months

<u>Question 2</u>
A taxicab charges a flat rate of $3.50 for the first 4 miles plus $1.50 for each additional mile driven.
a.   Create a linear function, $C(m)$, of this situation.

b.   If the cab has driven 17 miles, find how much the ride costs. Show your work.

c.   If Todd pays $26 for the ride, how many miles did the cab driver take Todd? Show your work.

<u>Question 3</u> (Linear Inequality Review)
If $a = 3$, find the largest integer for x that will satisfy the inequality below:

$$ax + x(2a - 4) < x + 24$$

(a) 2   (b) 3   (c) 4   (d) 5

Question 4

Donald Duck painted his house white. Below is the surface area of the house that was painted white based on hours.

Hours	1	2	3	4
Surface Area Painted White (ft^2)	38	62	86	110

Donald wrote an equation for the surface area of the house pained white, y, based on x hours. He believes the y-intercept is equal to 38 ft^2. Choose the correct statement.

(1) Donald is correct because 38 is the number that first appears in the table.
(2) Donald is correct because the y-intercept is the value of y when x is equal to 1.
(3) Donald is incorrect because the y-intercept is the value of y when x is equal to 0.
(4) Donald is incorrect because the value of y increases by 24 every time the value of x increases by 1.

Question 5-8

5.

The growth of a certain organism can be modeled by $C(t) = 10(1.029)^{24t}$, where $C(t)$ is the total number of cells after t hours. Which function is approximately equivalent to $C(t)$?

1) $C(t) = 240(.083)^{24t}$

2) $C(t) = 10(.083)^{t}$

3) $C(t) = 10(1.986)^{t}$

4) $C(t) = 240(1.986)^{\frac{t}{24}}$

6.

Materials A and B decay over time. The function for the amount of material A is $A(t) = 1000(0.5)^{2t}$ and for the amount of material B is $B(t) = 1000(0.25)^{t}$, where t represents time in days. On which day will the amounts of material be equal?

1) initial day, only
2) day 2, only
3) day 5, only
4) every day

7.

Mario's $15,000 car depreciates in value at a rate of 19% per year. The value, V, after t years can be modeled by the function $V = 15,000(0.81)^{t}$. Which function is equivalent to the original function?

1) $V = 15,000(0.9)^{9t}$

2) $V = 15,000(0.9)^{2t}$

3) $V = 15,000(0.9)^{\frac{t}{9}}$

4) $V = 15,000(0.9)^{\frac{t}{2}}$

8.

Sheba opened a retirement account with $36,500. Her account grew at a rate of 7% per year compounded annually. She made no deposits or withdrawals on the account. At the end of 20 years, what was the account worth, to the *nearest dollar*?

1) $87,600
2) $130,786
3) $141,243
4) $1,483,444,463

Question 9
Marilyn collects old dolls. She purchases a doll for $450. Research shows this doll's value will increase by 2.5% each year. Write an equation that determines the value, V, of the doll t years after purchase. Assuming the doll's rate of appreciation remains the same, will the doll's value be doubled in 20 years? Justify your reasoning.

Question 10
A car was purchased for $25,000. Research shows that the car has an average yearly depreciation rate of 18.5%.

Create a function that will determine the value, $V(t)$, of the car t years after purchase.

Determine, to the *nearest cent*, how much the car will depreciate from year 3 to year 4.

Questions 11-14

11.	12.
A company that manufactures radios first pays a start-up cost, and then spends a certain amount of money to manufacture each radio. If the cost of manufacturing r radios is given by the function $c(r) = 5.25r + 125$, then the value 5.25 best represents 1) the start-up cost 2) the profit earned from the sale of one radio 3) the amount spent to manufacture each radio 4) the average number of radios manufactured	The amount Mike gets paid weekly can be represented by the expression $2.50a + 290$, where a is the number of cell phone accessories he sells that week. What is the constant term in this expression and what does it represent? 1) $2.50a$, the amount he is guaranteed to be paid each week 2) $2.50a$, the amount he earns when he sells a accessories 3) 290, the amount he is guaranteed to be paid each week 4) 290, the amount he earns when he sells a accessories
13. The cost of airing a commercial on television is modeled by the function $C(n) = 110n + 900$, where n is the number of times the commercial is aired. Based on this model, which statement is true? 1) The commercial costs $0 to produce and $110 per airing up to $900. 2) The commercial costs $110 to produce and $900 each time it is aired. 3) The commercial costs $900 to produce and $110 each time it is aired. 4) The commercial costs $1010 to produce and can air an unlimited number of times.	14. Each day, a local dog shelter spends an average of $2.40 on food per dog. The manager estimates the shelter's daily expenses, assuming there is at least one dog in the shelter, using the function $E(x) = 30 + 2.40x$. Which statements regarding the function $E(x)$ are correct? I. x represents the number of dogs at the shelter per day. II. x represents the number of volunteers at the shelter per day. III. 30 represents the shelter's total expenses per day. IV. 30 represents the shelter's nonfood expenses per day. (1) I and III (3) II and III (2) I and IV (4) II and IV

Question 15

During physical education class, Andrew recorded the exercise times in minutes and heart rates in beats per minute (bpm) of four of his classmates. Which table best represents a linear model of exercise time and heart rate?

Student 1

Exercise Time (in minutes)	Heart Rate (bpm)
0	60
1	65
2	70
3	75
4	80

(1)

Student 3

Exercise Time (in minutes)	Heart Rate (bpm)
0	58
1	65
2	70
3	75
4	79

(3)

Student 2

Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	70
2	83
3	88
4	90

(2)

Student 4

Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	65
2	66
3	73
4	75

(4)

Question 16

Which of the three situations given below is best modeled by an exponential function?

I. A bacteria culture doubles in size every day.
II. A plant grows by 1 inch every 4 days.
III. The population of a town declines by 5% every 3 years.

(1) I, only   (3) I and II
(2) II, only   (4) I and III