Date Completed: _____
Mentor Initials: _____

Exponential Equations (Basic)

1. An advertising agency guarantees that its services will increase website traffic by 4.5% compared to each previous week. Which type of function best models the weekly guaranteed website traffic as the number of weeks increases?

A. Increasing exponential
B. Decreasing exponential
C. Increasing linear
D. Decreasing linear
E. Increasing cubic

2. Each year the value of an investment increases by 3.5% of the previous year's value. The initial value of the investment was \$400. Which equation gives the value of the investment y, in dollars, x years after the initial investment was made?

A. $y = 400(.35)^x$
B. $y = 400(1.035)^x$
C. $y = 400(1.35)^x$
D. $y = 400(3.5)^x$
E. $y = 400(13.5)^x$

3. What is the y-coordinate of the y-intercept of the graph $y = 5^x + 8$?

A. 5
B. 6
C. 7
D. 8
E. 9

4. Marcy opens a bank account that earns interest at a rate of 3% compounded annually. She puts \$240 in the account when she opens it and does not make any more deposits into or withdrawals from the account for 3 years. If the amount of money in the account after 3 years is given by the expression $240(1.03)^3$, which of the following expressions gives the amount of money in the account after 1 year?

A. $80(1.03)$
B. $240(1.03)$
C. $80(1.03)^3$
D. $240(1.01)^3$
E. $80(1.01)$

5. 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 2 every t days.
E. The number of water hyacinths increased by 4 every t days.

6. At the beginning of a study, the number of bacteria in a population is 120,000. The number of bacteria doubles every hour for a limited period of time. For this period of time, which equation models the number of bacteria y in this population after x hours?

A. $y = 120{,}000^{2x}$
B. $y = x^2 + 120{,}000$
C. $y = 2x^2 + 120{,}000$
D. $y = 120{,}000(2)^x$
E. $y = 120{,}000 + 240{,}000(x)$

7. What is the y-intercept of the graph of $y = 5^x$ in the xy-plane?

A. (1,5)
B. (1,0)
C. (0,5)
D. (0,1)
E. (5,1)

8. Of the following five 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.
E. Each successive year, 2% of the initial savings and $100 is added to the value of the account.

9. The graph of the exponential function f in the xy-plane, where $y = f(x)$, has a y-intercept of d, where d is a positive constant. Which of the following could define the function f ?

A. $f(x) = -4(d)^x$
B. $f(x) = 4(x)d$
C. $f(x) = d(4)^x$
D. $f(x) = d(-x)^4$
E. $f(x) = d(x)^4$

10. A radioactive substance decays at an annual rate of 11 percent. If the initial amount of the substance is 250 grams, which of the following functions f models the remaining amount of the substance, in grams, t years later?

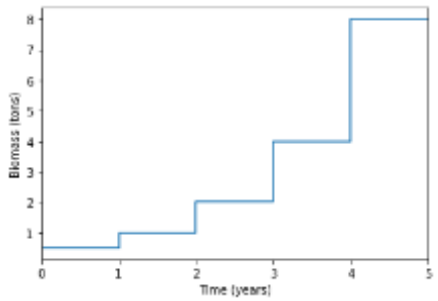
A. $f(t) = 250(0.89)^t$
B. $f(t) = 250(0.11)^t$
C. $f(t) = 0.89(250)^t$
D. $f(t) = 250(1.11)^t$
E. $f(t) = 0.11(t)^{250}$

11. Which of the following describes an exponential relationship between the pair of variables listed?

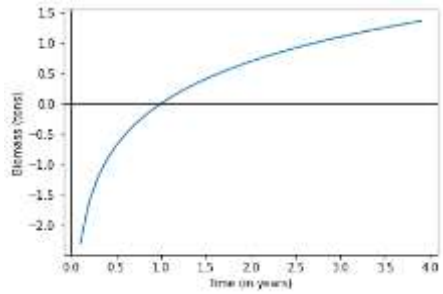
A. For every 5-millimeter increase m in the thickness of a piece of glass, the intensity of light I traveling through the glass decreases by 25%.
B. Each second, s, a car's speed C increases at a constant rate of 5 meters per second.
C. With every 33-foot decrease in depth d below the surface of water, the pressure p on an object decreases by 14.7 pounds per square inch.
D. The depth d of water remaining in a reservoir decreases by 10 inches each minute m as the water is being pumped out at a constant rate.
E. Beyond a minimum spending threshold, for every additional \$50 spent on resources for a computer science classroom, d, the class can support an additional 2 students, s, each semester.

12. 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 $(0,0)$.)

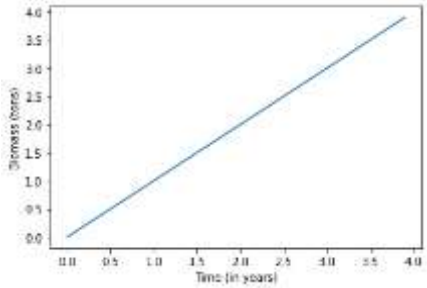
A.



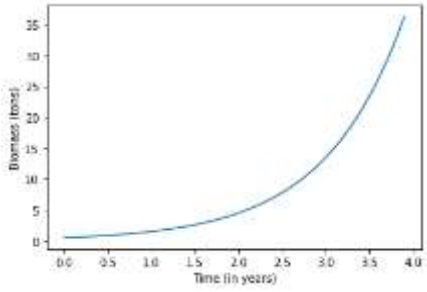
B.



C.



D.



13. $P = 195(1.004)^{\frac{t}{5}}$

The equation above can be used to model the population, in thousands, of a certain city t years after 2010. According to the model, the population is predicted to increase by 0.4% every n months. What is the value of n?

A. 5
B. 6
C. 10
D. 12
E. 60