Name: _____

A.SSE.B.3: Modeling Exponential Functions 1

1 The expression $300(4)^{x+3}$ is equivalent to
1) $300(4)^{x}(4)^{3}$
2) $300(4^{x})^{3}$
3) $300(4)^{x}+300(4)^{3}$
4) $300^{x}(4)^{3}$

2 A computer application generates a sequence of musical notes using the function $f(n)=6(16)^{n}$, where n is the number of the note in the sequence and $f(n)$ is the note frequency in hertz. Which function will generate the same note sequence as $f(n)$?
1) $g(n)=12(2)^{4n}$
2) $h(n)=6(2)^{4n}$
3) $p(n)=12(4)^{2n}$
4) $k(n)=6(8)^{2n}$

3 Nora inherited a savings account that was started by her grandmother 25 years ago. This scenario is modeled by the function $A(t)=5000(1.013)^{t+25}$, where $A(t)$ represents the value of the account, in dollars, t years after the inheritance. Which function below is equivalent to $A(t)$?
1) $A(t)=5000[(1.013^{t})]^{25}$
2) $A(t)=5000[(1.013)^{t}+(1.013)^{25}]$
3) $A(t)=(5000)^{t}(1.013)^{25}$
4) $A(t)=5000(1.013)^{t}(1.013)^{25}$

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

5 The number of bacteria grown in a lab can be modeled by $P(t)=300\bullet 2^{4t}$, where t is the number of hours. Which expression is equivalent to $P(t)$?
1) $300\bullet 8^{t}$
2) $300\bullet 16^{t}$
3) $300^{t}\bullet 2^{4}$
4) $300^{2t}\bullet 2^{2t}$

6 In an organism, the number of cells, $C(d)$, after d days can be represented by the function $C(d)=120\bullet 2^{3d}$. This function can also be expressed as
1) $C(d)=240^{3d}$
2) $C(d)=960\bullet 2^{d}$
3) $C(d)=120\bullet 6^{d}$
4) $C(d)=120\bullet 8^{d}$

Name: _____

7 The population of a city can be modeled by $P(t) = 3810(1.0005)^{7t}$, where $P(t)$ is the population after t years. Which function is approximately equivalent to $P(t)$?

1) $P(t) = 3810(0.1427)^t$
2) $P(t) = 3810(1.0035)^t$
3) $P(t) = 26,670(0.1427)^t$
4) $P(t) = 26,670(1.0035)^t$

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

9 Miriam and Jessica are growing bacteria in a laboratory. Miriam uses the growth function $f(t) = n^{2t}$ while Jessica uses the function $g(t) = n^{4t}$, where n represents the initial number of bacteria and t is the time, in hours. If Miriam starts with 16 bacteria, how many bacteria should Jessica start with to achieve the same growth over time?

1) 32
2) 16
3) 8
4) 4

10 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

11 A laboratory technician used the function $t(m) = 2(3)^{2m+1}$ to model her research. Consider the following expressions:

I. $6(3)^{2m}$ II. $6(6)^{2m}$ III. $6(9)^m$

The function $t(m)$ is equivalent to

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

12 Jacob and Jessica are studying the spread of dandelions. Jacob discovers that the growth over t weeks can be defined by the function $f(t) = (8) \cdot 2^t$. Jessica finds that the growth function over t weeks is $g(t) = 2^{t+3}$. Calculate the number of dandelions that Jacob and Jessica will each have after 5 weeks. Based on the growth from both functions, explain the relationship between $f(t)$ and $g(t)$.

A.SSE.B.3: Modeling Exponential Functions 1
Answer Section

1 ANS: 1 REF: 062313ai
2 ANS: 2 REF: 011714ai
3 ANS: 4 REF: 011821ai
4 ANS: 2
$V = 15{,}000(0.81)^t = 15{,}000((0.9)^2)^t = 15{,}000(0.9)^{2t}$

REF: 081716ai
5 ANS: 2 REF: 081801ai
6 ANS: 4
$C(d) = 120 \bullet 2^{3d} = 120 \bullet \left(2^3\right)^d = 120 \bullet 8^d$

REF: 082218ai
7 ANS: 2
$(1.0005)^7 \approx 1.0035$

REF: 081913ai
8 ANS: 3
$C(t) = 10(1.029)^{24t} = 10(1.029^{24})^t \approx 10(1.986)^t$

REF: 061614ai
9 ANS: 4
$16^{2t} = n^{4t}$

$(16^2)^t = (n^4)^t$

$((4^2)^2)^t = ((n^2)^2)^t$

REF: 011519ai
10 ANS: 4
$1000(0.5)^{2t} = 1000(0.5^2)^t = 1000(0.25)^t$

REF: 011923ai
11 ANS: 3
$t(m) = 2(3)^{2m+1} = 2(3)^{2m}(3)^1 = 6(3)^{2m} = 6(3^2)^m = 6(9)^m$

REF: 012019ai

12 ANS:

$f(5) = (8) \cdot 2^5 = 256 \qquad f(t) = g(t)$

$g(5) = 2^{5+3} = 256 \qquad (8) \cdot 2^t = 2^{t+3}$

$2^3 \cdot 2^t = 2^{t+3}$

$2^{t+3} = 2^{t+3}$

REF: 011632ai