Test #6: Unit #6 – Analysis of Exponential Functions

Name_____ **Date**_____ **Period**_____

Multiple Choice	× (9/7)	
Free Response	× 1	
	Total Score out of 36	

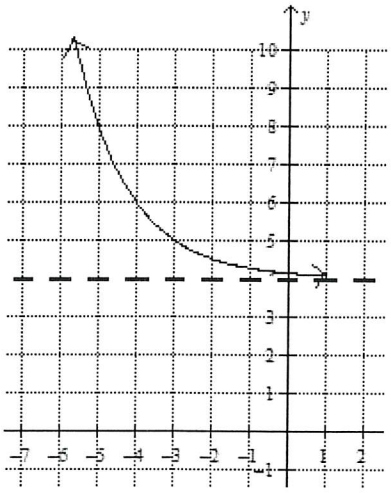
MULTIPLE CHOICE – Calculator Permitted

1. The point (–2, 4) is a point on the graph of an exponential function, $f(x) = \left(\frac{1}{2}\right)^x$. What is the point on the graph of $g(x) = -\left(\frac{1}{2}\right)^{x-3} + 1$ that corresponds to the point (–2, 4)?

A. (5, 5) B. (1, –3) C. (–5, –3)

D. (–1, 3) E. (–1, 5)

2. An exponential function, $f(x) = b^{-x+c} + d$, is pictured to the right. Which of the following statements is/are true?



I. The function is a decay function.

II. The value of b is such that $0 < b < 1$.

III. The value of d is 4.

A. I, II and III
B. I only
C. II and III only
D. I and II only
E. I and III only

3. Solve the equation for x: $\sqrt{\frac{b^{2x-3}}{b^{4x+1}}} = b^{x} \cdot b^{x-3}$

A. $x = -1$

B. $x = 3$

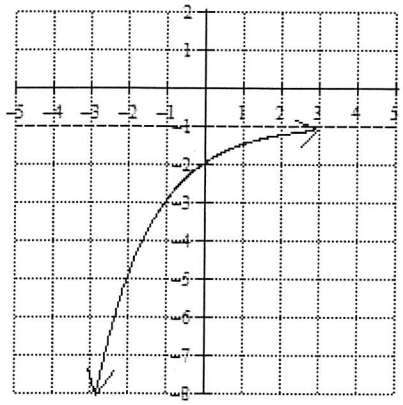
C. $x = \frac{1}{3}$

D. $x = \frac{2}{3}$

E. $x = \frac{5}{3}$

The graph of an exponential function, $F(x) = a \cdot b^{x+1} + c$ is pictured to the right. Use the graph to answer questions 4 – 6.

4. Which of the following statements is/are true about the graph of the function.



I. It can be concluded that the value of $a \cdot c > 0$.

II. As $x \to \infty$, the graph of $F(x)$ increases with bound.

III. The graph of $F(x)$ is an example of an exponential decay function.

A. I only B. II only C. I and II only

D. III only E. II and III only

5. Which of the following statements is true about the values of a and b in the equation of $F(x)$?

A. The value of $a < 0$ and the value of b is such that $0 < b < 1$.

B. The value of $a < 0$ and the value of b is such that $b > 1$.

C. The value of $a > 0$ and the value of b is such that $b > 1$.

D. The value of $a > 0$ and the value of b is such that $0 < b < 1$.

E. The value of $a < 0$ but no conclusion can be made about the value of b.

6. What is the value of b in the equation of the function $F(x)$?

A. $b = -3$ B. $b = -1$ C. $b = \frac{1}{2}$

D. $b = 2$ E. $b = \frac{1}{6}$

7. Solve the exponential equation: $2^{x+3} \cdot 4^{x-1} = -3^{2x-2} + 5$

A. 0.413 B. 0.470 C. –3

D. 5.312 E. 4.724

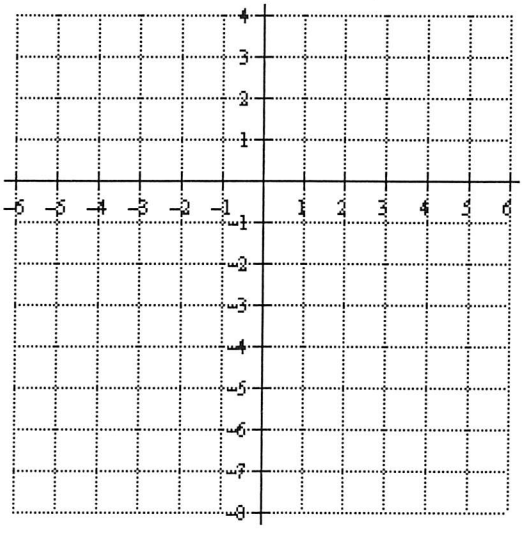
FREE RESPONSE

Consider the exponential function $f(x) = -\left(\frac{1}{2}\right)^{-x+2} - 3$ to answer the following questions.

a. Classify the function as a growth or decay. Specifically justify each part of your reasoning based on the equation of $f(x)$.

b. Determine the range of $f(x)$ justifying your reasoning based on the equation.

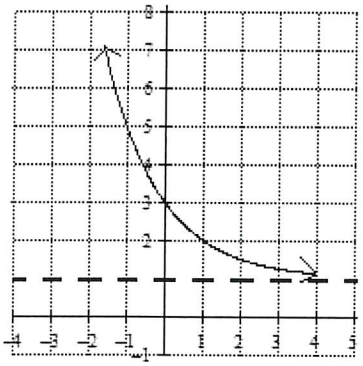
c. Sketch a graph of $f(x)$. Show the complete numerical analysis performed to transform the points on the graph of $y = \left(\frac{1}{2}\right)^x$ into corresponding points on $f(x)$.



d. Suppose that $g(x) = \left(\frac{1}{2}\right)^{x+1} - 5$. Find all value(s) of x at which $f(x) = g(x)$. Interpret your solutions in the context of the graphs of $f(x)$ and $g(x)$.

MULTIPLE CHOICE – Calculator NOT Permitted

8. The graph of an exponential function, $f(x) = a(b)^x + c$, is pictured to the right. Which of the following statements is/are true?



I. The range of $f(x)$ is $(1, \infty)$.

II. The value of c is 1.

III. The value of b is such that $0 < b < 1$.

A. I only
B. II only
C. III only
D. I and II only
E. I, II, and III

9. What is the range of the graph of the exponential function $f(x) = (2)^{-x-3} - 3$?

A. $(-\infty, 2)$

B. $(-\infty, -3)$

C. $(2, \infty)$

D. $(-3, \infty)$

E. None of these

10. Which of the following statements can be made about the graph of $G(x) = 2^{-x+3} - 2$?

I. The graph of $G(x)$ has a horizontal asymptote at $y = -2$.

II. The function is an example of an exponential growth function.

III. The range of $G(x)$ is $(-2, \infty)$.

A. I only
B. I and II only
C. I and III only
D. III only
E. I, II and III

11. Completely simplify the following expression using the properties of exponents $\sqrt{\frac{a^{2n+2} \cdot a^{n-3}}{a^{n-5}}}$.

A. a^{n+2}

B. a^{n-3}

C. a^{2n-3}

D. a^{2n-7}

E. $a^{\sqrt{2n}+2}$

The table of values below represent the graph of an exponential function, $H(x) = a \cdot b^x + c$. Use the table to answer questions 12 – 13.

x	−7	−4	−1	2	5	8	11
$H(x)$	−125	−13	1	2.75	2.969	2.996	2.999

12. Which of the following statements is/are true?

I. As $x \to -\infty$, the graph of $H(x)$ decreases without bound.

II. As $x \to \infty$, the graph of $H(x)$ increases with bound.

III. $H(x)$ represents an exponential decay because the graph is entirely below the horizontal asymptote.

A. I only
B. II only
C. I and II only
D. II and III only
E. I, II and III

13. Which of the following statements is/are true about the equation of $H(x)$?

I. The value of $a < 0$.

II. The value of $c = 3$.

III. The graph of $H(x)$ has a range of $(-\infty, 3)$.

A. I and II only

B. II and III only

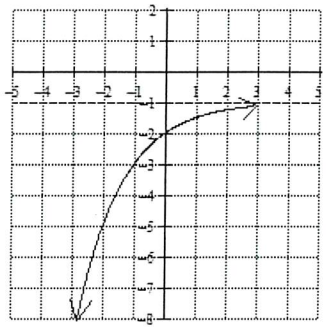
C. I only

D. II only

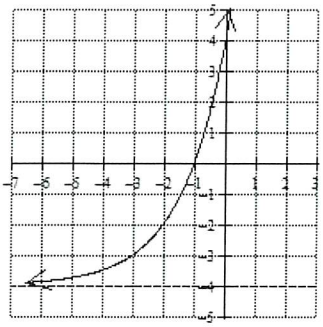
E. I, II and III

14. Which of the following are examples of exponential growth functions?

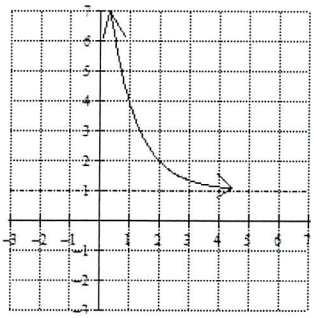
I.



II.



III.



A. I only

B. I and II only

C. I and III only

D. II and III only

E. I, II, and III

FREE RESPONSE

Pictured below is a table of values that represents the graph of an exponential function, $G(x) = a \cdot b^{-x-2} + c$. Use the table to answer the questions below.

x	−17	−9	−4	−3	−2	−1	5	9	13
$G(x)$	3.005	3.117	3.889	4.333	5	6	37.172	176	878.79

a. What is the value of c in the equation of $G(x)$? Give a reason based on the end behavior of $G(x)$.

b. Is the function $G(x)$ the result of either or both an x – axis and/or y – axis reflection? Give evidence to support your answer based on the given information.

c. Your response to part b) should have led you to conclude that $a > 0$ or $a < 0$. Find the actual value of a to validate your conclusion about a from part b). Show your work.

d. Based on the given information, is $b > 1$ or is $0 < b < 1$? Give a reason for your answer. Then, find the actual value of b to validate your answer. Show your work.