REVIEW UNIT 5 DAY 2 NO CALCULATOR
FREE RESPONSE QUESTION 2

Consider the logarithm functions below to answer the following questions.

$$f(x) = -2 + ln(6 + 3x) \qquad g(x) = 2\,ln\,x + ln(x + 2)$$

a. For what value(s) of x is $f(x) = 3$. Leave your answer(s) in terms of e.

$3 = -2 + \ln(6+3x)$

$5 = \ln(6+3x)$ (Log form)

$e^5 = 6 + 3x$ (Exp form)

$e^5 - 6 = 3x$

$\frac{1}{3}e^5 - 2 = x$

b. Identify the equation of the vertical asymptote of the graph of f(x). Does the graph lie to the left or to the right of the vertical asymptote? Show your work and explain your reasoning.

$6 + 3x > 0$

$3x > -6$

$x > -2$

$\therefore$ VA @ $x = -2$

$\therefore$ The graph lies to right of VA

FREE RESPONSE continued

c. Find the equation of $f^{-1}(x)$ in the form $f^{-1}(x) = a \cdot b^{x+c} + d$. Show your work.

$f(x) = -2 + ln(6 + 3x)$

$x = -2 + \ln(6+3y)$

$x+2 = \ln(6+3y)$ (Log form)

$e^{x+2} = 6+3y$ (Exp form)

$e^{x+2} - 6 = 3y$

$\frac{1}{3}e^{x+2} - 2 = f^{-1}(x)$

d. For what value(s) of x does $g(x) = \ln(3x)$. Show your work.

$g(x) = 2\ln x + ln(x+2)$ (x>0, x>-2)

$\ln(3x) = 2\ln x + \ln(x+2)$

$\ln(3x) = \ln x^2 + \ln(x+2)$

$\ln(3x) = \ln x^2(x+2)$

$3x = x^2(x+2)$

$3x = x^3 + 2x^2$

$0 = x^3 + 2x^2 - 3x$

$0 = x(x^2 + 2x - 3)$

$0 = x(x+3)(x-1)$

$x = -3$, $x = 0$, $x = 1$

MULTIPLE CHOICE

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

False I. $\log_3\left(\frac{1}{27}\right) = -4$ $\log_3 (3)^{-3} \stackrel{?}{=} -4$ $-3 \stackrel{?}{=} -4$

True II. $\log_2(2^{x-3}) = x - 3$ $(x-3)\log_2 2 = x-3$ $(x-3)\cdot 1 = x-3$

False III. $\log_b(\sqrt[5]{b^3}) = \frac{5}{3}$ $\log_b b^{3/5} \stackrel{?}{=} 5/3$ $\frac{3}{5} \neq 5/3$

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

9. Write the expanded logarithmic expression $3\log x - \frac{1}{5}\log y + \log z$ in condensed form.

$= \log x^3 - \log y^{\frac{1}{5}} + \log z$

$= \log\left(\frac{x^3 z}{\sqrt[5]{y}}\right)$

10. Between what two integers does the value of $\log_5 130$ lie?

$5^2 = 25$
$5^3 = 125$
$5^4 = 625$

$\log_5 130$ is between 3 and 4

11. What is the equation of the asymptote of the inverse function, $f^{-1}(x)$, if $f(x) = 2^{x-3} - 5$?

VA

f has HA @ $y = -5$

$\therefore$ f^{-1} has VA @ $x = -5$

A. x = 3
B. y = 3
C. y = –3
D. x = -5
E. y = -5

x	−5	−2	0	2	4	6
$f(x)$	−2.999	−2.982	−2.865	−2	4.389	51.598

All y-values above y = −3

$\lim_{x \to -\infty} f(x) = -3$

12. A table of values for the exponential function $H(x) = a \cdot b^x + k$ is pictured above. Which of the statements below is/are true?

I. The graph of $H^{-1}(x)$ lies to the right of the vertical asymptote. True

II. The value of k in the equation of H(x) is 52. False, $k = -3$ (HA @ $y = -3$)

False III. The argument of $H^{-1}(x)$ could be $(-x - 3)$. $-x - 3 > 0$, $-x > 3$, $x < -3$

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

D. II only E. I, II and III

13. Consider the logarithmic function $f(x) = \log_2(2 - 5x)$ to determine which of the following statements is/are true.

True I. The value of x = 0 is in the domain of the function f(x). $2 - 5x > 0$, $-5x > -2$, $x < 2/5$

False II. The value of f(-1) is between 2 and 3, but closer to 2. $f(-1) = \log_2(7)$, $2^2 = 4$, $2^3 = 8$

False III. The graph of $f^{-1}(x)$ has a horizontal asymptote at $y = -\frac{2}{5}$. f has VA @ $x = \frac{2}{5}$; f^{-1} has HA @ $y = \frac{2}{5}$

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

D. II and III only E. III only

14. Solve for x: $2 - e^{5x+3} = 10$

$-e^{5x+3} = 8$

$e^{5x+3} = -8$ (Exp form)

$\ln(-8) = 5x + 3$ (log form)

Argument must be greater than zero

∴ No Solution