Instructions:

- DO NOT WRITE on the exam.
- Choose the one choice that best completes the statement or answers the questions.
- Fill in the answer to each problem on your computer-scored answer sheet.
- There is no time limit.
- No books, notes, or calculators allowed.

1. Let $f(x) = \log_3(2x + 6)$. State the domain of $f(x)$.

    a. $(-\infty, -3)$ b. $(-3, \infty)$ c. $(0, \infty)$

    d. $(-\infty, 3)$ e. $(3, \infty)$ f. $(-\infty, \infty)$

2. Solve for x in the following equation $7^{3x-6} = 7^{9-2x}$

    a. $x = 3$ b. $x = 0$ c. $x = -3$ d. $x = 15$ e. No solution

Given that $f(x)$ and $g(x)$ are one-to-one functions. Use the following table for problems 3 – 5.

x	-3	-2	-1	0	1	2	3
$f(x)$	-6	-5	-4	-3	-1	2	4
$g(x)$	3	2	1	0	-1	-3	-5

3. Evaluate $g(f(0))$

    a. -9 b. -3 c. 0 d. 3 e. Insufficient information.
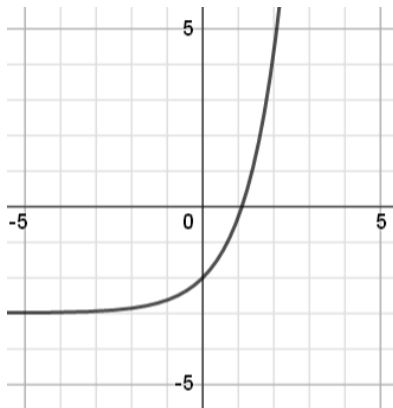
4. Evaluate $g^{-1}(f(0))$

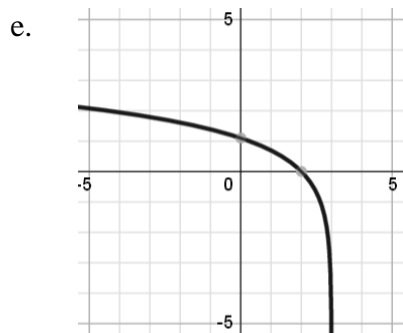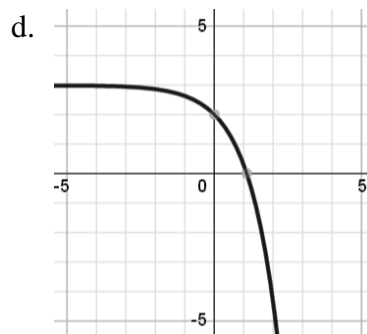   a. -3 b. $\frac{1}{3}$ c. 2 d. 3 e. Insufficient information.
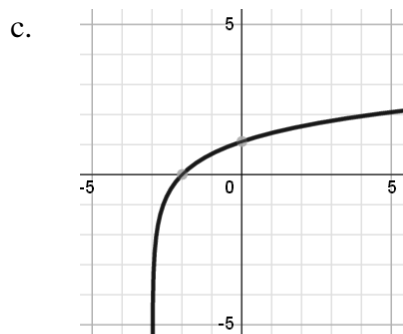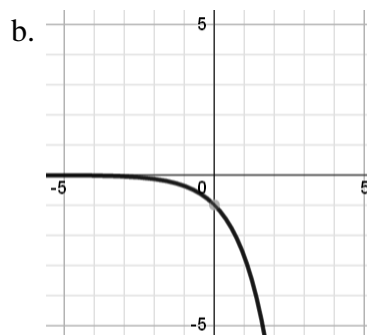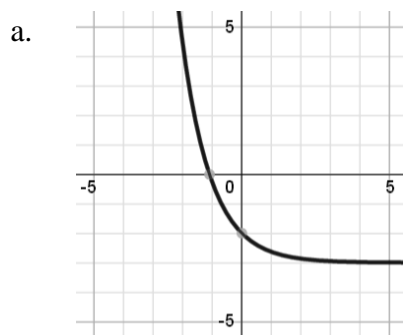
5. Which of the following relationships is accurate?

    a. $f(2) < g(2) < g^{-1}(2)$ b. $g(2) < f(2) < g^{-1}(2)$ c. $g^{-1}(2) < g(2) < f(2)$

    d. $f(2) < g^{-1}(2) < g(2)$ e. $g(2) < g^{-1}(2) < f(2)$ f. $g^{-1}(2) < f(2) < g(2)$

6. The graph of $f(x)$ is given here:

Which of the following is a graph of $f^{-1}(x)$

a.

b.

c.

d.

e.

f. None of the above

7. Find the inverse of the following one-to-one function.

$$h(x) = \frac{3x - 4}{5 - x}$$

a. $h^{-1}(x) = \frac{5x+4}{x+3}$

b. $h^{-1}(x) = \frac{3x+5}{x+4}$

c. $h^{-1}(x) = \frac{x+5}{3x-5}$

d. $h^{-1}(x) = \frac{3}{5}x + \frac{4}{x}$

e. $h^{-1}(x) = \frac{11}{5-x} - 3$

f. None of the above.

8. For $f(x) = \frac{5}{x}$ and $g(x) = \sqrt{x + 6}$, find the domain of the composite function $f \circ g$.

a. $(-\infty, -6) \cup (-6, \infty)$

b. $[-6, \infty)$

c. $(-6, \infty)$

d. $(-\infty, 0) \cup (0, \infty)$

e. $(-\infty, -6)$

f. $(-\infty, 6) \cup (6, \infty)$

9. Simplify the expression

$$\log_3 7 \cdot \log_4 9 \cdot \log_7 2$$
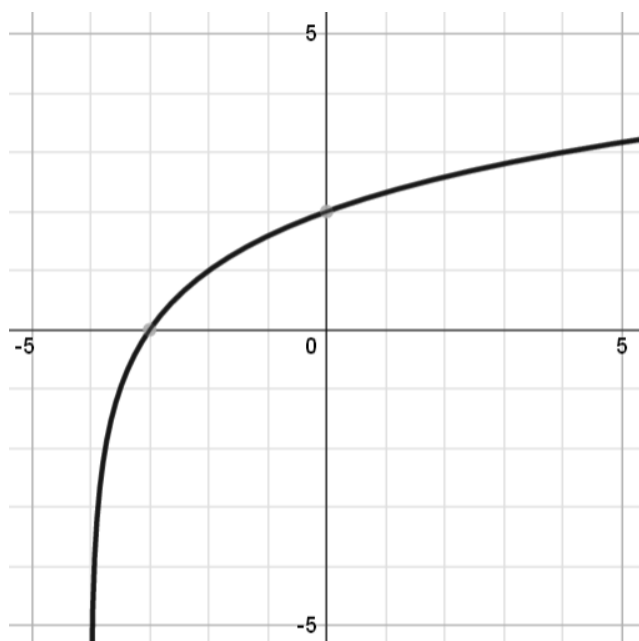
a. -1

b. 0

c. 1

d. 2

e. 3

10. Select the function that best represents the given graph.

a. $f(x) = \log_2(x + 4)$

b. $f(x) = \log_2(x - 4)$

c. $f(x) = \log_2(x + 2)$

d. $f(x) = \log_2(x - 2)$

e. $f(x) = 2\log_2(x - 2)$

f. $f(x) = 2\log_2(x + 2)$

11. Write as a single logarithm

$$\log_4 15 + \log_4 21 - 2\log_4 3$$

a. $\log_4 27$

b. $\log_4 33$

c. $\log_4 108$

d. $\log_4 35$

e. $\log_4 95$

f. None of the above.

12. Write the expression as a sum or difference of logarithms

$$\ln\sqrt{\frac{(x+4)(x^2-7)}{3x-2}}$$

a. $\ln(x+4) + 2\ln(x-7) - 3\ln(x-2)$

b. $\frac{1}{2}\ln(x+4) + \ln(x-7) - \frac{3}{2}\ln(x-2)$

c. $\ln(x+4) + \ln(x^2-7) - \ln(3x-2)$

d. $\frac{1}{2}\ln(x+4) + \frac{1}{2}\ln(x^2-7) - \frac{1}{2}\ln(3x-2)$

e. None of the above.

13. Solve for x in the following equation $\log_5(10-x) = 2$

a. $x = -15$ b. $x = 0$ c. $x = 10$ d. $x = 35$ e. No solution

14. Solve for x in the following equation $3^{2x} + 3^x = 12$

a. $x = 0$ b. $x = 1$ c. $x = \log_3 4$ d. $x = 3$ e. No solution

15. Solve for x in the following equation $\ln(x-5) = \ln(3x+11)$

a. $x = -13$ b. $x = -8$ c. $x = 0$ d. $x = e^{-8}$ e. No solution

16. The equation $5^{2x^2+x-5} = 5^{6x+7}$ has two solutions for x. Find the sum of the two solutions.

a. $x = \frac{5}{2}$ b. $x = \frac{3}{2}$ c. $x = 0$ d. $x = -\frac{3}{2}$ e. $x = -\frac{5}{2}$

17. Pam invests \$2,000 in an account that is compounded continuously at a rate of 3%. For t being the number of years from the initial investment, how long will it take for Pam to double her money?

a. $t = \frac{100}{3}\ln 2$ b. $t = \frac{3}{100}\ln 2$ c. $t = \ln 60$ d. $t = \frac{\ln 2}{\ln 3 - \ln 100}$ e. $t = \frac{\ln 2}{\ln 100 - \ln 3}$

18. A rare strain of bacteria grows according to the law of uninhibited growth. Initially, there are 70 bacteria. After 3 hours the bacteria output is 210. Give the equation that models the population P of the bacteria as a function of time t in hours.

a. $P(t) = 210e^{\frac{1}{3}t}$ b. $P(t) = 70e^{\frac{\ln 3}{3}t}$ c. $P(t) = 70e^{\frac{1}{3}t}$

d. $P(t) = 3e^{\frac{1}{70}t}$ e. $P(t) = 70e^{\frac{3}{5}t}$ f. None of the above.

19. Find the focus of the parabola
$$-8(y - 7) = 2x^2 + 8x + 8$$

a. $(-1, 7)$ b. $(1, -7)$ c. $(7, -2)$

d. $(0, 6)$ e. $(-2, 8)$ f. $(-2, 6)$

20. Find the equation of a parabola for which the directrix is $x = -1$ and focus is $(3, -3)$.

a. $(x - 1)^2 = 4(y + 3)$ b. $(y - 1)^2 = 16(x + 3)$ c. $(y + 3)^2 = 8(x - 1)$

d. $(x - 1)^2 = -16(y + 3)$ e. $(y + 3)^2 = -8(x - 1)$ f. $(y - 3)^2 = 8(x + 1)$

Key:

1   B
2   A
3   D
4   C
5   E
6   C
7   A
8   C
9   C
10 A
11 D
12 D
13 A
14 B
15 E
16 A
17 A
18 B
19 F
20 C