1. Decide whether the function is one-to-one.

\[ y = 2(x + 3)^2 - 5 \]

Is the given function one-to-one?

- Yes
- No

2. Fill in the blanks.

The domain of \( f \) is equal to the ______ of \( f^{-1} \), and the range of \( f \) is equal to the ______ of \( f^{-1} \).

\[ \text{The domain of } f \text{ is equal to the } \boxed{\text{range}} \text{ of } f^{-1}, \text{ and the range of } f \text{ is equal to the } \boxed{\text{domain}} \text{ of } f^{-1}. \]

3. Fill in the blank.

If a function \( f \) has an inverse and \( f(-3) = 6 \), then \( f^{-1}(6) = \) _____.

4. Determine whether the pair of functions \( f \) and \( g \) are inverses of each other.

Are the functions inverses of each other?

- Yes
- No
5. The function \( f(x) = 3x + 2 \) is one-to-one.
   (a) Find the inverse of \( f \).
   (b) State the domain and range of \( f \).
   (c) State the domain and range of \( f^{-1} \).
   (d) Graph \( f, f^{-1} \), and \( y = x \) on the same set of axes.

(a) What is the inverse of \( f \)?

\[ f^{-1}(x) = \square \]
(Simplify your answer. Use integers or fractions for any numbers in the expression.)

(b) State the domain and range of \( f \). Select the correct choice below and fill in any answer boxes within your choice.

\( \bigcirc \) A. The domain of \( f \) is \( \{ x \square \} \). The range of \( f \) is \( \{ y \square \} \).
   (Simplify your answers. Type an inequality or a compound inequality.)

\( \bigcirc \) B. The domain of \( f \) is \( \{ x \square \} \). The range of \( f \) is all real numbers.
   (Simplify your answer. Type an inequality or a compound inequality.)

\( \bigcirc \) C. The domain of \( f \) is all real numbers. The range of \( f \) is \( \{ y \square \} \).
   (Simplify your answer. Type an inequality or a compound inequality.)

\( \bigcirc \) D. The domain and range of \( f \) are all real numbers.

(c) State the domain and range of \( f^{-1} \). Select the correct choice below and fill in any answer boxes within your choice.

\( \bigcirc \) A. The domain of \( f^{-1} \) is \( \{ x \square \} \). The range of \( f^{-1} \) is \( \{ y \square \} \).
   (Simplify your answers. Type an inequality or a compound inequality.)

\( \bigcirc \) B. The domain of \( f^{-1} \) is \( \{ x \square \} \). The range of \( f^{-1} \) is all real numbers.
   (Simplify your answer. Type an inequality or a compound inequality.)

\( \bigcirc \) C. The domain of \( f^{-1} \) is all real numbers. The range of \( f^{-1} \) is \( \{ y \square \} \).
   (Simplify your answer. Type an inequality or a compound inequality.)

\( \bigcirc \) D. The domain and range of \( f^{-1} \) are all real numbers.

(d) Graph \( f, f^{-1} \), and \( y = x \) on the same set of axes. Choose the correct graph below.

\( \bigcirc \) A.
\( \bigcirc \) B.
\( \bigcirc \) C.
\( \bigcirc \) D.
6. For the function \( f(x) = \frac{3x + 2}{x - 5}, x \neq 5 \); that is one-to-one, (a) write an equation for the inverse function in the form \( y = f^{-1}(x) \), (b) graph \( f \) and \( f^{-1} \) on the same axes, and (c) give the domain and the range of \( f \) and \( f^{-1} \). If the function is not one-to-one, say so.

(a) Write an equation for the inverse function in the form \( y = f^{-1}(x) \). Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- A. \( f^{-1}(x) = \), \( x \neq \)
- B. The function is not one-to-one.

(b) Choose the correct graph below. Note that graph of function \( f \) is shown in blue, and the graph of \( f^{-1} \) is shown in red.

- A.
- B.
- C. The inverse does not exist.

(c) The domain of \( f \) is \( \square \) and the range of \( f \) is \( \square \).
(Type your answers in interval notation.)

Give the domain and the range of \( f^{-1} \). Select the correct choice below and, if necessary, fill in the answer boxes to complete your choice.

- A. The domain of \( f^{-1} \) is \( \square \) and the range of \( f^{-1} \) is \( \square \).
(Type your answers in interval notation.)
- B. The inverse does not exist.

7. The graph of a function \( f \) is shown. Use the graph to find \( f^{-1}(0) \).

\[ f^{-1}(0) = \square \]
8. An organization determines that the cost per person of chartering a bus is $C(x)$, where $x$ is the number of people in the group and $C(x)$ is in dollars. What does $C^{-1}(7)$ represent?

Choose the correct answer below.

☐ A. It represents how much it will cost per person if 7 people charter a bus.

☐ B. It represents how many people can be taken for a cost of 7 dollars per person.

9. If $g(x) = \left(\frac{1}{2}\right)^x$, find $g(-3)$.

$g(-3) = \square$

10. Graph the equation.

$y = 6^x$

Choose the correct graph on the right.

Be sure you can do this from scratch.

11. Use the graph of $f(x) = 6^x$ to sketch the graph of $f(x) = 6^x - 4$ using techniques of transformation.
12. Write an equation for the graph below, which represents an exponential function $f$ with base 2 or 3, translated and/or reflected.

\[ f(x) = \]

13. Solve the equation.

\[ \left( \frac{1}{e} \right)^{-x} = \left( \frac{1}{e^3} \right)^{x + 9} \]

The solution set is \{ \[ \] \},

(Type an integer or a simplified fraction. Use a comma to separate answers as needed.)

14. Find the present value that will grow to $22,000 if interest is 6% compounded quarterly for 12 quarters.

The present value is $\[ \]$. (Round to the nearest cent as needed.)
15. Evaluate the logarithmic expression without using a calculator. Remember that $\log_a x$ is the exponent to which $a$ must be raised in order to obtain $x$.

(a) $\log_{4} 16$  
(b) $\log_2 1$  
(c) $\log_{10.001} 1$  
(d) $\log_5 \sqrt{5}$  
(e) $\log_e \left( \frac{1}{e^8} \right)$  
(f) $\log_{\frac{1}{4}} 16$

(a) $\log_{4} 16 = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

(b) $\log_2 1 = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

(c) $\log_{10.001} 1 = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

(d) $\log_5 \sqrt{5} = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

(e) $\log_e \left( \frac{1}{e^8} \right) = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

(f) $\log_{\frac{1}{4}} 16 = \square$  
(Simplify your answer. Type an integer or a simplified fraction.)

16. Solve the logarithmic equation.

$x = 4^{\log_4(1)}$

The solution set is $\{\square\}$.

17. Solve the given logarithmic equation.

$\log_{(x+7)} 8 = 1$

The solution set is $\{\square\}$.  
(Simplify your answer. Type an integer or a fraction.)
18. Use the graph of \( f(x) = \log_3 x \) to graph the function 
\( f(x) = \log_3 (x - 2) \).

19. Write an equation for the graph below, which represents a logarithmic function \( f \) with base 2 or 3, translated and/or reflected.

\[ f(x) = \]
20. Write the expression as a single logarithm with coefficient 1. Assume all variables represent positive real numbers.

\[ 2 \log_b(z + 5) + \log_b(3z + 4) \]

Choose the correct answer.

- [ ] \( \log_b(z + 5)(3z + 4)^2 \)
- [ ] \( \log_b \frac{(z + 5)^2}{3z + 4} \)
- [ ] \( \log_b \frac{3z + 4}{(z + 5)^2} \)
- [ ] \( \log_b (z + 5)^2(3z + 4) \)

21. Suppose \( f(x) = \log_a(x) \) and \( f(3) = 6 \). Determine the function value.

\[
\begin{align*}
\text{a. } f\left(\frac{1}{9}\right) & \quad \text{b. } f(27) & \quad \text{c. } f(9) & \quad \text{d. } f\left(\frac{\sqrt{3}}{3}\right)
\end{align*}
\]

\[
\begin{align*}
a. f\left(\frac{1}{9}\right) &= \square \\
\text{(Simplify your answer.)} \\
b. f(27) &= \square \\
\text{(Simplify your answer.)} \\
c. f(9) &= \square \\
\text{(Simplify your answer.)} \\
d. f\left(\frac{\sqrt{3}}{3}\right) &= \square \\
\text{(Simplify your answer.)}
\end{align*}
\]

22. Find the exact value.

\[ \log 0.01 \]
23. Find the value.

\[ \ln \left( \frac{1}{e^9} \right) \]

24. Use the change-of-base theorem to find the logarithm.

\[ \log_{2^9} \]

(Simplify your answer. Do not round until the final answer. Then round to four decimal places as needed.)

25. Solve the exponential equation. Express irrational solutions as decimals correct to the nearest thousandth.

\[ 2^{x-4} = 3^{2x} \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

\( \text{A.} \) The solution set is \{\text{\[\_\]}}\).

(Round to the nearest thousandth as needed. Use a comma to separate answers as needed.)

\( \text{B.} \) The solution is the empty set.

26. Solve the exponential equation. Express irrational solutions as decimals correct to the nearest thousandth.

\[ \left( \frac{1}{2} \right)^x = -3 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

\( \text{A.} \) The solution set is \{\text{\[\_\]}}\).

(Round to the nearest thousandth as needed. Use a comma to separate answers as needed.)

\( \text{B.} \) The solution is the empty set.
27. Solve the exponential equation. Express solutions in exact form.

\[ 4e^{2x} + e^x = 14 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ A. The solution set is \[ \{ \} \].
  (Use a comma to separate answers as needed. Type an exact answer in simplified form.)

○ B. The solution is the empty set.

28. Solve the logarithmic equation.

\[ \ln x + \ln x^2 = 2 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ A. The solution set is \[ \{ \} \].
  (Simplify your answer. Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression.)

○ B. The solution is the empty set.

29. Solve the logarithmic equation.

\[ \log_4(2x - 9) + \log_4(x + 4) = 1 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ A. The solution set is \[ \{ \} \].
  (Type an exact answer, using radicals as needed. Use a comma to separate answers as needed.)

○ B. The solution is the empty set.

30. Solve the logarithmic equation.

\[ (\log z)^2 = \log z^5 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ A. The solution set is \[ \{ \} \].
  (Simplify your answer. Type an integer or a fraction. Use a comma to separate answers, but do not use commas in any individual numbers.)

○ B. The solution is the empty set.
31. Find \( f^{-1}(x) \), and give the domain and range.

\[
f(x) = e^{x^5 + 1}
\]

\( f^{-1}(x) = \square \)

What is the domain of \( f^{-1} \)?

☐ (Type your answer in interval notation.)

What is the range of \( f^{-1} \)?

☐ (Type your answer in interval notation.)

32. A population is increasing according to the exponential function \( y = 5 \ e^{0.04x} \), where \( y \) is in millions and \( x \) is the number of years. How large will the population be in 3 yr? Which of the following is the correct procedure to answer the question?

A. Evaluate \( y = 5 \ e^{0.04(1/3)} \).
B. Solve \( 5 \ e^{0.04x} = 15 \).
C. Evaluate \( y = 5 \ e^{0.04(3)} \).
D. Solve \( 5 \ e^{0.04x} = 3 \).

Choose the correct answer below.

☐ A. Evaluate \( y = 5 \ e^{0.04(1/3)} \).
☐ B. Solve \( 5 \ e^{0.04x} = 15 \).
☐ C. Evaluate \( y = 5 \ e^{0.04(3)} \).
☐ D. Solve \( 5 \ e^{0.04x} = 3 \).

33. Find the half-life of a radioactive element, which decays according to the function \( A(t) = A_0 e^{-0.0317t} \), where \( t \) is the time in years.

The half-life of the element is \( \square \) years.

(Round to the nearest tenth.)
In a study during the 1970's, it was found that one model of legislative turnover in the country A parliament was described by the following formula.

\[ M(t) = 418 e^{-0.05t} \]

In this formula \( M(t) \) was the number of continuously serving members at time \( t \). Here, \( t = 0 \) represents 1965, \( t = 1 \) represents 1966, and so on. Use this model to approximate the number of continuously serving members in each year.

(a) 1968  (b) 1972  (c) 1977

(a) Find the number of continuously serving members in 1968.

☐ (Round to the nearest whole number as needed.)

(b) Find the number of continuously serving members in 1972.

☐ (Round to the nearest whole number as needed.)

(c) Find the number of continuously serving members in 1977.

☐ (Round to the nearest whole number as needed.)
ANSWERS

1. No

2. range
domain

3. -3

4. No

5. \[
\frac{x - 2}{3} = \frac{3}{3}
\]
   D
   D
   D

6. \[
\frac{5x + 2}{x - 3}, 3
\]
   A
   \((-\infty, 5) \cup (5, \infty)\)
   \((-\infty, 3) \cup (3, \infty)\)
   A, \((-\infty, 3) \cup (3, \infty), (-\infty, 5) \cup (5, \infty)\)

7. 3

8. B

9. 8

10. [Graph Image]
11.  

12.  \[2^{x+1} + 3\]

13.  \[-\frac{27}{4}\]

14.  18,400.52

15.  

16.  1

17.  1
19. $\log_2(x - 3) - 1$

20. D

21. 
- 12

18

12

- 3

22. - 2

23. - 9

24. 3.1699

25. A, - 1.843

26. B

27. A, $\ln \frac{3}{4}$

28. A, $\frac{3}{2}e^2$
29. \[ A, \frac{1 + \sqrt{321}}{4} \]

30. A, 1,000000

31. \[ \ln (x - 1) - 5 \]

\( (1, \infty) \)

\( (-\infty, \infty) \)

32. C

33. 21.9

34. 360

295

229