1. Express the following rule in function notation "subtract 5, then divide by 3".

a. \( f(x) = \frac{x - 5}{3} \)  

b. \( f(x) = x - \frac{3}{5} \)

c. \( f(x) = \frac{x - 3}{5} \)

d. \( f(x) = \frac{x}{3} \)

e. \( f(x) = x - \frac{5}{3} \)

2. Evaluate the function \( f(x) = \frac{5 - x}{5 + x} \) at \( x = 11 \).

a. \( f(11) = -\frac{9}{8} \)

b. \( f(11) = -6 \)

c. \( f(11) = -\frac{3}{8} \)

d. \( f(11) = 0 \)

e. \( f(11) = -\frac{3}{5} \)

3. Evaluate the following piecewise defined function at \( x = 2 \), \( x = 4 \), and \( x = 8 \).

\[ f(x) = \begin{cases} 
1 & \text{if } x < 4 \\
8x - 2 & \text{if } x \geq 4 
\end{cases} \]

a. \( f(2) = 14, f(4) = 8, f(8) = 8 \)

b. \( f(2) = 1, f(4) = 1, f(8) = 62 \)

c. \( f(2) = 14, f(4) = 8, f(8) = 62 \)

d. \( f(2) = 1, f(4) = 30, f(8) = 62 \)

e. \( f(2) = 14, f(4) = 30, f(8) = 62 \)

4. Consider the function.

\( f(x) = x^2 + 4 \)

Evaluate the \( f(x + 4) \) and simplify.

Evaluate the \( f(x) + f(4) \) and simplify.
5. Consider the function.

\[ f(x) = 2x + 6 \]

Evaluate the \( f(x^2) \) and simplify.

Evaluate the \( (f(x))^2 \) and simplify.

6. For the function \( f(x) = 5x^2 + 1 \), find \( \frac{f(a + h) - f(a)}{h} \), \( h \neq 0 \).

   a. \( \frac{f(a + h) - f(a)}{h} = 5h - 10a \)
   b. \( \frac{f(a + h) - f(a)}{h} = 5h + 5a \)
   c. \( \frac{f(a + h) - f(a)}{h} = 5h + 10a \)
   d. \( \frac{f(a + h) - f(a)}{h} = h + a \)
   e. \( \frac{f(a + h) - f(a)}{h} = 10h + 5a \)

7. The domain of the function \( f(x) = \frac{4}{5x + 15} \) is \( (-\infty, -3) \cup (-3, \infty) \).

   a. True
   b. False
Sketch the graph of the function \( f \) and find the domain from the graph.

\[ f(x) = \sqrt{x + 5} \]

### Domain

- **a.** Domain: \([-5, \infty)\)
- **b.** Domain: \([0, \infty)\)
- **c.** Domain: \([0, \infty)\)
- **d.** Domain: \((-\infty, 5]\)
- **e.** Domain: \([-5, \infty)\)
Sketch the graph of the function.

\[ f(x) = -1 \]
Sketch the graph of the function.

\[ F(x) = \frac{3}{x + 1} \]
Sketch the graph of the following piecewise defined function.

\[ f(x) = \begin{cases} 
2 & \text{if } x \leq 3 \\
 x + 3 & \text{if } x > 3 
\end{cases} \]
12 What is the average rate of change of the function \( f(x) = 2x - 4 \) between \( x = 5 \) and \( x = 6 \) ?

a. \(-4\)  

b. \(4\)  

c. \(6\)  

d. \(-2\)  

e. \(2\)

13 The graph of a function is given below. Determine the interval on which the function is decreasing.

a. \(x \in (-\infty, 4)\)  

b. \(x \in (-\infty, 2) \cup (4, \infty)\)  

c. \(x \in (4, \infty)\)  

d. \(x \in (-4, -2)\)  

e. \(x \in (2, 4)\)

14 If \(g\) and \(u\) are both odd functions, then the product of \(g\) and \(u\) is an ________ function.

15 In order for \(f(x) = x^n\) to be an even function, the integer \(n\) has to be an ________ number.
The graph of the function \( y = x^2 - 4x \) is given below. Find the coordinate of its vertex and its intercepts.

vertex \((x, y)\) (__, __)

\(x\) - intercept(s) ______

\(y\) - intercept(s) ______
17 The graph of the function \( y = -x^2 + 6x \) is given below. Find the coordinates of its vertex and its intercepts.

![Graph of the function \( y = -x^2 + 6x \).](image)

- a. vertex \((4, -9)\);
- x-intercepts 0, 6;
- y-intercept 4

- b. vertex \((3, 18)\);
- x-intercepts 0, 6;
- y-intercept 0

- c. vertex \((-3, 8)\);
- x-intercepts 0, 8;
- y-intercept 0

- d. vertex \((3, 9)\);
- x-intercepts 0, 6;
- y-intercept 0

- e. vertex \((6, -18)\);
- x-intercepts 0, 5;
- y-intercept 0

18 If a ball is thrown directly upward with a velocity of 32 ft/s, its height (in feet) after \( t \) seconds is given by \( y = 32t - 16t^2 \). What is the maximum height attained by the ball?

- a. 13 feet
- b. 7 feet
- c. 4 feet
- d. 16 feet
- e. 10 feet
Find the domain of the function.

\[ f(x) = \frac{\sqrt{x + 8}}{x - 9} \]

a. \( x \in [-8, \infty) \)  
   b. \( x \in [-8, 9) \cup (9, \infty) \)

c. \( x \neq 9 \)  
   d. \( x \in (-\infty, -9) \cup (-9, 8] \)

e. \( x \in (-\infty, -9) \cup (-9, 8] \)

Use \( f(x) = 2x - 5 \) and \( g(x) = 5 - x^2 \) to evaluate the expression \((g \circ f)(-1)\).

a. \((g \circ f)(-1) = -48\)  
   b. \((g \circ f)(-1) = -44\)

c. \((g \circ f)(-1) = -52\)  
   d. \((g \circ f)(-1) = -50\)

e. \((g \circ f)(-1) = -46\)

Determine whether the function \( f(x) = \sqrt{9x} \) is one-to-one.

a. No  
   b. Yes

Is \( f(x) = 8x^4 + 1 \) not a one-to-one function?

a. Yes  
   b. No

Assume \( f \) is a one-to-one function. If \( f(x) = 4 - 2x \), find \( f^{-1}(-2) \).

\( f^{-1}(-2) = \)_____

Use the Property of Inverse Functions to find the inverse function of \( f(x) = x + 8 \).

a. \( f^{-1}(x) = -x - 8 \)  
   b. \( f^{-1}(x) = x - 8 \)

c. \( f^{-1}(x) = x + 8 \)  
   d. \( f^{-1}(x) = -x + 8 \)

e. \( f^{-1}(x) = 8x - 8 \)
25 Find the inverse function $f^{-1}(x)$ of $f(x) = \frac{1}{x + 5}$.

a. $f^{-1}(x) = x + 5$

b. $f^{-1}(x) = \frac{1}{x} - 5$

c. $f^{-1}(x) = x - 5$

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

e. $f^{-1}(x) = \frac{1}{x} + 5$

26 Sketch the graph of the function $P(x) = (x - 2)(x + 2)(x - 1)$.

Choose the correct answer from the following.
27 Find the exponential function $f(x) = a^x$ whose graph is given.

Choose the answer from the following:

- a. $f(x) = 3^x + 3$
- b. $f(x) = 3^{-x}$
- c. $f(x) = 3^x$
- d. $f(x) = 3^x$

28 The population of a certain species of bird is limited by the type of habitat required for nesting. The population behaves according to the logistic growth model

$$n(t) = \frac{1060}{0.2 + 27e^{-0.208t}}$$

where $t$ is measured in years. What size does the population approach as time goes on?

Choose the answer from the following:

- a. 1060
- b. 10600
- c. 15900
- d. 5300
29 Express the equation \( \ln (x + 3) = 5 \) in exponential form.

Choose the correct answer from the following:

a. \( x = e^5 - 3 \)  

b. \( x = e^3 - 5 \)  

c. \( x = e^3 + 5 \)  

d. No correct answer  

e. \( x = e^5 + 3 \)  

30 Evaluate the expression \( \log_5 25 \).

Choose the correct answer from the following.

a. 25  

b. No correct answer  

c. 5  

d. 2  

31 Use the definition of the logarithmic function to find \( x \):

\[ \log_6 x = 0 \]
1. d  2. c  3. d  4. \[ f(x+4) = x^2 + 8x + 20; \]
   \[ f(x) + f(4) = x^2 + 24 \]
5. \[ f(x^2) = 2x^2 + 6; \]
   \[ (f(x))^2 = 4x^2 + 24x + 36 \]
6. c  7. a  8. a  9. d  10. c  11. c  12. e  13. e  14. even 15. even 16. \[ \frac{-4}{0.4} \]