Contents

Introduction to College Algebra CLEP Practice Questions

Welcome to the College Algebra CLEP Practice Questions resource, a meticulously curated collection of questions designed to prepare you for the College Algebra CLEP test. This resource is focused on rigorous, high-quality practice that mirrors the format, difficulty, and structure of the actual exam.

What is the CLEP Test?

The College-Level Examination Program (CLEP) allows students to earn college credit by demonstrating their mastery of college-level material through a standardized exam. The College Algebra CLEP test evaluates your understanding of algebraic concepts typically covered in a one-semester college algebra course.

How This Resource Helps You Prepare

This resource includes a comprehensive set of practice questions devised to align closely with the CLEP College Algebra test. These questions are not designed to teach or provide detailed explanations but are intended to offer intensive practice in authentic test conditions.

Key Features

Authentic Test-Style Questions: Practice questions are identical in format and style to those found on the actual CLEP exam.
Varied Difficulty Levels: Questions are crafted to cover a wide range of difficulty, ensuring thorough preparation.
Test-Focused Practice: Simulate real exam conditions to build confidence and improve problem-solving skills.

By engaging with these questions, you'll be able to sharpen your algebra skills, identify areas for improvement, and feel confident and prepared to succeed on the CLEP College Algebra test.

Linear Equations

1. Solve for x in the equation $2x + 5 = 17$.
   a) 5
   b) 6
   c) 7
   d) 8
2. If $3x - 4 = 2x + 6$, what is the value of x?

a) 2
b) 4
c) 8
d) 10

3. The sum of a number and 9 is 20. What is the number?

a) 9
b) 11
c) 20
d) 29

4. Solve the equation $5(x - 1) = 15$.

a) 2
b) 3
c) 4
d) 5

5. Find x in the equation $\frac{1}{2}x - 3 = 4$.

a) 10
b) 12
c) 14
d) 16

6. If $4x + 3 = 2x + 15$, what is the value of x?

a) 3
b) 6
c) 9
d) 12

7. Solve for x: $x + 2 = 3(x - 4)$.

a) 3
b) 4
c) 5
d) 6

8. A number is 3 more than twice another number. If their sum is 45, what is the smaller number?

a) 14
b) 15
c) 16
d) 17

9. The difference between a number and 7 is 9. Find the number.

a) 9
b) 16
c) 17
d) 18

10. Solve for x in the equation $7x - 2 = 5x + 6$.

a) 2
b) 3
c) 4
d) 5

Quadratic Equations

1. Solve the quadratic equation:
$$x^2 - 5x + 6 = 0$$

A) $x = 1$, $x = 6$

B) $x = 2$, $x = 3$

C) $x = -2$, $x = -3$

D) $x = -1$, $x = -6$

2. Solve for x:
$$2x^2 + 3x - 5 = 0$$

  A) $x = 1$, $x = -\frac{5}{2}$

  B) $x = \frac{1}{2}$, $x = -5$

  C) $x = -1$, $x = \frac{5}{2}$

  D) $x = \frac{-3 \pm \sqrt{41}}{4}$

3. Which of the following represents the vertex form of the quadratic function $f(x) = x^2 + 4x + 4$?

  A) $f(x) = (x + 2)^2$

  B) $f(x) = (x - 2)^2$

  C) $f(x) = (x + 4)^2$

  D) $f(x) = (x - 4)^2$

4. Determine the axis of symmetry for the quadratic equation:
$$y = 3x^2 - 12x + 7$$

  A) $x = 2$

  B) $x = -2$

  C) $x = 3$

  D) $x = -3$

5. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are real and equal, which of the following statements is true?

  A) $b^2 - 4ac > 0$

  B) $b^2 - 4ac = 0$

  C) $b^2 - 4ac < 0$

  D) The roots are complex numbers.

6. Find the maximum or minimum value of the quadratic function
$$f(x) = -2x^2 + 4x + 1$$

  A) Maximum at $x = -1$

  B) Maximum at $x = 1$

  C) Minimum at $x = -2$

  D) Minimum at $x = 2$

7. Solve the equation by completing the square:
$$x^2 + 6x + 8 = 0$$

  A) $x = -4$, $x = -2$

  B) $x = -1$, $x = -7$

  C) $x = 3$, $x = -9$

D) $x = 2$, $x = -8$

8. The roots of the quadratic equation $3x^2 + kx - 9 = 0$ are $\frac{1}{2}$ and 3. Find the value of k.

9. Determine the nature of the roots for the quadratic equation:

$$5x^2 + 2x + 1 = 0$$

A) Two distinct real roots

B) Exactly one real root

C) Two complex roots

D) Infinitely many roots

10. A quadratic function is given by $f(x) = 2x^2 - 8x + 6$. What is the y-intercept of this function?

11. Which quadratic equation has roots -3 and 4?

A) $x^2 + x - 12 = 0$

B) $x^2 - x - 12 = 0$

C) $x^2 - x + 12 = 0$

D) $x^2 + x + 12 = 0$

12. Solve the quadratic equation: $x^2 - 4x - 5 = 0$

Polynomial Functions

1. What is the degree of the polynomial $f(x) = 4x^5 - 3x^3 + 2x - 7$?

A) 1

B) 3

C) 5

D) 7

2. Given the polynomial $p(x) = x^4 + 2x^3 - x^2$, which of the following is a root?

A) $x = 0$

B) $x = 1$

C) $x = -1$

D) $x = 2$

3. Find the polynomial function with zeros at $x = -3$, $x = 2$, and $x = 4$.

4. If $g(x) = 2x^3 - 5x^2 + 4x - 8$, what is $g(-1)$?

5. Which polynomial is factorable?

A) $x^2 + 4x + 7$

B) $x^2 - 9$

C) $x^2 + 1$

D) $x^2 - 5x + 6$

6. Simplify the expression $(2x - 1)(3x + 4)$.

7. What is the leading coefficient of the polynomial $h(x) = -6x^2 + 3x - 1$?

A) -6

B) 3

C) 1

D) -1

8. Determine the remainder when the polynomial $f(x) = x^3 - 4x^2 + 5x - 2$ is divided by $x - 2$.

9. If $p(x) = 3x^4 - 7x^3 + 2x^2 - x + 5$, what is the coefficient of x^2?

A) 3

B) -7

C) 2

D) 5

10. True or False: The polynomial $x^3 + x + 1$ has a degree of 3.

Rational Equations

1. Solve the rational equation:

$$\frac{x+2}{x-1} = \frac{3}{x+1}$$

A) $x = -2$

B) $x = 1$

C) $x = 3$

D) $x = -3$

2. If $\frac{2}{x} + \frac{3}{x+4} = 1$, what is the value of x?

3. Simplify and solve for x:

$$\frac{5x}{x^2 - 4} - \frac{3}{x^2 - 4} = 0$$

4. Solve the equation:

$$\frac{1}{x} + \frac{1}{x+2} = \frac{3}{4}$$

5. The equation $\frac{4x}{x+5} = 2$ is equivalent to which of the following? Select the correct form.

A) $4x = 2x + 10$

B) $4x = 2x - 10$

C) $4x + 10 = 2x$

D) $2(x + 5) = 4$

6. Solve for x:
$$\frac{x}{x+1} = \frac{3}{5}$$

7. A rational equation is given by $\frac{3}{2x} = \frac{5}{6}$. What is the solution to this equation?

    A) $x = \frac{9}{10}$

    B) $x = \frac{5}{9}$

    C) $x = \frac{5}{4}$

    D) $x = \frac{9}{5}$

8. Solve the rational expression:
$$\frac{2x+3}{x^2-9} = \frac{1}{x-3}$$

9. If $\frac{4}{x-3} - \frac{2}{x+3} = 1$, find x.

10. Solve the equation:
$$\frac{x-1}{x+2} = \frac{3x+1}{2x+3}$$

11. Solve for x:
$$\frac{x+7}{x^2-4x-5} = 0$$

12. Find the solution of the equation $\frac{x+3}{x-2} = \frac{x-1}{x+4}$.

Exponential and Logarithmic Functions

1. Solve for x: $e^{2x} = 7$.

2. Evaluate the logarithm: $\log_2 16$.

    A. 2
    B. 3
    C. 4
    D. 5

3. What is the inverse of the function $f(x) = \ln(x-1)$?

4. If $3^x = 81$, what is the value of x?

5. Simplify: $\log_{10} 1000$.

    A. 1
    B. 2
    C. 3
    D. 4

6. Solve for y: $\log(y) + \log(10) = 2$.

7. If $y = e^x$, express x in terms of y.

8. What is the solution to $\ln(x) = 2$?

9. Find x: $5^x = 25$.

10. Convert to exponential form: $\log_b(x) = y$.

11. Evaluate $\log_5(1)$.

A. 0
B. 1
C. 5
D. Undefined

12. Solve the equation: $3^{x+1} = 81$.

13. What is $\log_3(27)$?

A. 1
B. 2
C. 3
D. 4

14. Simplify: $e^{\ln(5)}$.

15. Solve for x: $\ln(3x) = 0$.

16. What is the base b if $\log_b(64) = 3$?

17. Convert the expression to a single logarithm: $\log_2(8) + \log_2(4)$.

18. If $\log_x(49) = 2$, find x.

19. Solve for x: $2^x = \frac{1}{8}$.

20. What is the value of $\log_{100}(10)$?

A. 1
B. 0.5
C. 2
D. 10

Systems of Equations

1. Solve the system of equations:
$$2x + 3y = 5$$
$$4x - y = 11$$

   a) $x = 2, y = 0$
   b) $x = 3, y = -1$
   c) $x = 1, y = 1$
   d) $x = -1, y = 3$

2. Which of the following is the solution to the system?
$$x + 2y = 7$$
$$3x - y = -1$$

   a) $x = 1, y = 3$
   b) $x = 0, y = 3$
   c) $x = 2, y = 2$
   d) $x = 3, y = 2$

3. Determine x and y such that:

$$5x + 4y = 3$$
$$x - 2y = 10$$

   a) $x = 2, y = -4$
   b) $x = 3, y = 2$
   c) $x = -2, y = 5$
   d) $x = -3, y = 4$

4. Find the values of x and y for the following system:

$$7x + 6y = 8$$
$$-3x + 2y = 1$$

   a) $x = 1, y = 0$
   b) $x = -1, y = 2$
   c) $x = 0, y = 1$
   d) $x = 2, y = -1$

5. Solve this system:

$$3x - y = 5$$
$$x + 4y = 13$$

   a) $x = 3, y = 2$
   b) $x = 4, y = 1$
   c) $x = 2, y = 3$
   d) $x = 5, y = -1$

6. What are the solutions for x and y?

$$2x + y = 11$$
$$x - y = 3$$

   a) $x = 4, y = 2$
   b) $x = 5, y = 1$
   c) $x = 7, y = 4$
   d) $x = 8, y = -1$

7. Solve the system:

$$x + y = 6$$
$$x - y = 4$$

   a) $x = 5, y = 1$
   b) $x = 6, y = 0$
   c) $x = 0, y = 6$
   d) $x = 3, y = 3$

8. Calculate the solution for x and y:

$$x - 3y = 3$$
$$2x + y = -4$$

   a) $x = -1, y = -2$
   b) $x = 1, y = -2$
   c) $x = 1, y = 1$
   d) $x = -2, y = 1$

9. What is the value of x and y that satisfies:

$$4x + 7y = 1$$
$$2x - 3y = 12$$

   a) $x = 3, y = 1$
   b) $x = 2, y = -1$

c) $x = 1, y = -1$
d) $x = 4, y = 2$

10. Solve for x and y:
$$5x + y = 14$$
$$3x - 2y = -6$$

a) $x = 2, y = 4$
b) $x = 0, y = 3$
c) $x = 3, y = 1$
d) $x = -1, y = 2$

Matrices and Determinants

1. Evaluate the determinant of the following 2×2 matrix:
$$\begin{pmatrix} 3 & 4 \\ 2 & 5 \end{pmatrix}$$

   A. 7
   B. 11
   C. 13
   D. 23

2. Given the 3×3 matrix:
$$\begin{pmatrix} 2 & 0 & 1 \\ 3 & 4 & -1 \\ 5 & 6 & 0 \end{pmatrix}$$

   Find the determinant.

3. Solve for the determinant of $\begin{pmatrix} k & 0 \\ 3 & k \end{pmatrix}$ in terms of k.

4. For which value(s) of k will the matrix $\begin{pmatrix} 2 & k \\ k & 2 \end{pmatrix}$ be singular?

5. If $A = \begin{pmatrix} 1 & 3 \\ 4 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 \\ 1 & 5 \end{pmatrix}$, calculate the determinant of $A \cdot B$.

6. What is the inverse of the matrix $\begin{pmatrix} 4 & 7 \\ 2 & 6 \end{pmatrix}$?

7. Which of the following operations would change the determinant of a matrix?

   A. Adding a scalar multiple of one row to another row.
   B. Multiplying a row by a nonzero scalar.
   C. Interchanging two rows.
   D. All of the above.

8. Find the determinant of the matrix after performing elementary row operations:
$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{pmatrix}$$

   Row 2 ← Row 2 + 3(Row 1)

9. If $C = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{pmatrix}$, calculate the determinant of C.

10. An identity matrix I of size 3×3 is defined. What is the determinant of $2I$?

Sequences and Series

1. **What is the 10th term of the arithmetic sequence where the first term is 5 and the common difference is 3?**

   A. 32
   B. 35
   C. 38
   D. 41

2. **Find the sum of the first 20 terms of the arithmetic series with a first term of 7 and a common difference of 4.**

3. **In a geometric sequence, the first term is 3 and the common ratio is 2. What is the 6th term?**

   A. 48
   B. 96
   C. 192
   D. 384

4. **Calculate the sum of the infinite geometric series with a first term of 10 and a common ratio of 0.5.**

   A. 15
   B. 20
   C. 25
   D. 30

5. **The 5th term of an arithmetic sequence is 18, and the 8th term is 30. What is the first term of the sequence?**

6. **If the sum of a finite geometric series is 62, the first term is 2, and the common ratio is 3, how many terms are in the series?**

7. **What is the value of the following series:**

$$\sum_{n=1}^{100}(2n+1)$$

8. **Find the fourth term of the sequence defined by the recursive formula $a_n = 2a_{n-1}+3$, with $a_1 = 1$.**

9. **Determine the common ratio of a geometric sequence if the third term is 16 and the sixth term is 128.**

10. **Consider the sequence given by the explicit formula $a_n = 4n^2 - n + 6$. What is the value of the fifth term?**

11. **For the arithmetic sequence with the explicit formula $a_n = 12 + 5(n-1)$, verify if the term 57 is in the sequence, and if so, which term it is.**

12. **Evaluate the series:**
$$5 + 10 + 20 + 40 + \cdots + 640$$

13. **A sequence is defined as $b_n = 7 - 3n$. What is the sum of the first 10 terms of this sequence?**

14. **Suppose you have an arithmetic sequence where the fifth term is 22 and the twelfth term is 50. What is the sum of the first 15 terms?**

15. **How many terms are there in the sequence 3, 6, 12, ..., that ends at 192?**

A. 5
B. 6
C. 7
D. 8

Probability and Statistics

1. **A box contains 4 red, 5 blue, and 3 green balls. If one ball is drawn at random, what is the probability that it is red?**

   A. $\frac{1}{3}$

   B. $\frac{1}{4}$

   C. $\frac{1}{5}$

   D. $\frac{1}{2}$

2. **What is the probability of rolling a sum of 7 with two dice?**

   A. $\frac{1}{6}$

   B. $\frac{1}{36}$

   C. $\frac{7}{36}$

   D. $\frac{5}{36}$

3. **If a fair coin is tossed 3 times, what is the probability of getting exactly 2 heads?**

4. **A deck of cards consists of 52 cards. What is the probability of drawing an Ace or a King?**

   A. $\frac{1}{13}$

   B. $\frac{2}{13}$

   C. $\frac{1}{26}$

   D. $\frac{1}{4}$

5. **An urn contains 7 red, 3 blue, and 10 white marbles. If two marbles are drawn at random without replacement, what is the probability that both are red?**

6. **A survey shows that 60% of people like apples, 70% like oranges, and 50% like both. What percentage of people like either apples or oranges?**

7. **A class consists of 10 boys and 15 girls. A student is selected at random. What is the probability that the student is a girl?**

   A. $\frac{2}{5}$

   B. $\frac{3}{5}$

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

   D. $\frac{1}{2}$

8. **A die is rolled, what is the probability that a number greater than 4 appears?**

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{2}{3}$

D. $\frac{1}{6}$

9. **The probability of winning a game is** 0.2**. What is the probability of losing the game?**

10. **In a room with 8 people, what is the probability that at least two people have the same birthday? (Assume 365 days in a year and ignore leap years.)**

11. **If the probability of rain on any given day is** $\frac{1}{4}$**, what is the probability that it rains exactly 2 days in a 5-day period?**

12. **A jar contains 10 black, 15 white, and 5 grey balls. If two balls are drawn at random with replacement, what is the probability that both are white?**

13. **The mean of a dataset is 20 and the sum of the data points is 400. How many data points are in the dataset?**

14. **If the variance of a dataset is 16, what is the standard deviation?**

A. 2

B. 4

C. 8

D. 16

15. **Which measure of central tendency is most affected by extreme values?**

A. Mean

B. Median

C. Mode

D. Range

16. **A set of exam scores is normally distributed with a mean of 70 and a standard deviation of 10. What percentage of students scored between 60 and 80?**

17. **If two events A and B are mutually exclusive, what is** $P(A \cup B)$ **if** $P(A) = 0.3$ **and** $P(B) = 0.4$**?**

18. **The probability of event A is 0.6, and event B is 0.7. Assuming A and B are independent, what is the probability of both A and B occurring?**

Trigonometry

1. Evaluate $\sin\left(\frac{\pi}{6}\right)$.

   A. $\frac{1}{2}$
   B. $\frac{\sqrt{3}}{2}$
   C. $\sqrt{2}$

D. 1

2. What is $\cos(0)$?

   A. 0
   B. 0.5
   C. 1
   D. Undefined

3. If $\tan(\theta) = 1$, which of the following could be θ?

   A. 0
   B. $\frac{\pi}{4}$
   C. $\frac{\pi}{2}$
   D. π

4. Solve for x: $\sin(x) = \frac{\sqrt{3}}{2}$, $0 \leq x < 2\pi$.

5. What is the exact value of $\cos(\frac{2\pi}{3})$?

   A. $-\frac{1}{2}$
   B. $\frac{1}{2}$
   C. $-\frac{\sqrt{3}}{2}$
   D. $\frac{\sqrt{3}}{2}$

6. Determine the principal value of $\arcsin(-\frac{1}{2})$.

7. Find θ if $\cos(\theta) = -\frac{\sqrt{2}}{2}$ and $0 \leq \theta \leq \pi$.

8. Evaluate $\tan(\frac{3\pi}{4})$.

9. Simplify the expression $\sin^2(x) + \cos^2(x)$.

10. If $\sec(\theta) = 2$, what is $\cos(\theta)$?

11. Which of the following is true for $\csc(\frac{\pi}{6})$?

A. $\frac{1}{2}$
B. $\sqrt{3}$
C. 2
D. Undefined

12. If $\cot(\theta) = -1$, what is a possible value of θ within 0 and 2π?

13. Solve the equation $2\sin(x) - 1 = 0$ for x in the interval $[0, 2\pi)$.

14. What is $\sin(\pi - x)$ in terms of $\sin(x)$?

15. Evaluate the expression $\cos(\pi + x)$ in terms of $\cos(x)$.

16. If $\tan(x) = \frac{3}{4}$, find $\sin(x)$ given that x is in the first quadrant.

17. Find x such that $\sin(2x) = \cos(x)$, within $0 \leq x < 2\pi$.

18. Determine the amplitude of the function $y = 3\sin(x)$.

19. Identify the period of $y = \cos(2x)$.

20. If $\sin(x) = \frac{4}{5}$ and x is in the first quadrant, find $\cos(x)$.

Complex Numbers

1. **What is the sum of** $(3 + 2i) + (4 - 5i)$**?**

   A. $7 - 3i$

   B. $1 + 7i$

   C. $7 + 3i$

   D. $7 - 7i$

2. **Multiply** $(2 + 3i)(1 - 4i)$ **and find the result.**

   A. $14 + 5i$

   B. $14 - 5i$

   C. $-10 + 5i$

   D. $-10 - 5i$

3. **What is the modulus of the complex number** $6 - 8i$**?**

   A. 2

   B. 10

   C. 20

   D. 100

4. **Divide the complex numbers** $(7 + 3i)$ **and** $(2 - i)$ **and express in standard form.**

   A. $2 + 5i$

   B. $3 - i$

   C. $1 + 4i$

   D. $3 + i$

5. **Find the conjugate of the complex number** $5 - 9i$**.**

   A. $5 + 9i$

   B. $-5 - 9i$

   C. $9 - 5i$

   D. $-5 + 9i$

6. **Solve the equation** $z^2 + 4z + 13 = 0$ **for complex numbers** z**.**

7. **Express** $\frac{4}{3+2i}$ **in the form** $a + bi$**.**

8. **If** $z = 3 + 4i$**, what is** $\bar{z}$**, the complex conjugate of** z**?**

   A. $3 - 4i$

B. $-3 + 4i$

C. $-3 - 4i$

D. $3 + 4i$

9. **Which of the following represents the square of i, the imaginary unit?**

A. 1

B. i

C. -1

D. $-i$

10. **Simplify the expression $(2 + i)^2$.**

A. $4 + 4i + i^2$

B. $3 + 4i$

C. $3 + 4i + i^2$

D. $4 + 4i - i^2$

11. **Add the complex numbers $(7 - 4i)$ and $(3 + 6i)$ and find the result.**

A. $10 + 2i$

B. $10 - 2i$

C. $4 + 10i$

D. $4 - 10i$

12. **What is the argument of the complex number $-3 + 3i$ when expressed in polar form?**

A. $\frac{\pi}{4}$

B. $\frac{3\pi}{4}$

C. $\frac{5\pi}{4}$

D. $\frac{7\pi}{4}$

13. **Convert the complex number $5 - 5i$ to polar form.**

14. **Find the imaginary part of $z = -2 + 7i$.**

A. -2

B. 7

C. -7

D. 2

15. **If $w = 1 - 2i$ and $z = -4 + i$, calculate wz.**

Absolute Value Inequalities

1. **Solve the inequality: $|2x - 3| < 7$**
   A. $x < 5$
   B. $-2 < x < 5$
   C. $x > 5$
   D. $x > -2$
2. **Which of the following represents the solution to $|x + 4| > 6$?**
   A. $x < -10$ or $x > 2$
   B. $x > 10$
   C. $x < 10$
   D. $4 < x < 10$
3. **Find the solution for: $|3x + 5| \leq 11$**
   A. $-4 \leq x \leq 2$
   B. $x \geq -2$
   C. $-6 < x < 6$
   D. $x \leq 6$
4. **Consider the inequality $|x-1| \geq 4$. Which of the following intervals represents the solution?**
   A. $x \leq -3$ or $x \geq 5$
   B. $3 < x < 5$
   C. $x = 1$
   D. $-3 < x < 5$
5. **Solve for x: $|4x + 9| \geq 12$**
   A. $x \geq 3$
   B. $x \leq -5.25$ or $x \geq 0.75$
   C. $x > 9$
   D. $x = 3$
6. **Determine the solution of the inequality: $|5 - x| < 2$**
   A. $3 < x < 7$
   B. $-2 < x < 2$
   C. $x > 3$
   D. $x < 7$
7. **Solve: $|x + 3| \leq -8$**
   A. $x > -11$
   B. $x < -3$
   C. No solution
   D. $x \leq 5$
8. **What is the range of x for which $|2x - 8| < 10$?**
   A. $x < 6$
   B. $-1 < x < 9$
   C. $x > -6$
   D. $3 < x < 8$
9. **Solve the inequality: $|x - 7| > 4$**
   A. $x < 3$ or $x > 11$
   B. $x \geq 5$
   C. $3 < x < 11$
   D. $x \leq 11$
10. **Determine x such that: $|x/2 + 1| \geq 3$**

A. $x \leq -8$ or $x \geq 4$

B. $-2 < x < 4$

C. $x > 0$

D. $x < 8$

11. **Find the solution set for:** $|x - 4| = 0$

    A. $x = 4$

    B. $x = 0$

    C. $x = -4$

    D. No solution

12. **Solve for x:** $|3x - 2| = 7$

    A. $x = 3$

    B. $x = -5$

    C. $x = \frac{3}{2}$ or $x = -\frac{5}{3}$

    D. $x = 5$

13. **Which x satisfies** $|x + 1| \leq 4$**?**

    A. $x \geq 3$

    B. $x \leq 5$

    C. $-5 \leq x \leq 3$

    D. $x < -1$

14. **Solve for x:** $4|x| - 1 \geq 15$

    A. $x \geq 4$

    B. $x \leq -4$ or $x \geq 4$

    C. $x \geq -3$

    D. $x < 0$

15. **Find the values of x for:** $|2x + 3| \leq 5$

    A. $x \leq -2$

    B. $-4 \leq x \leq 1$

    C. $x \leq 3$

    D. $x = 0$

Logarithm Properties

1. Simplify the expression: $\log_2 8 + \log_2 4$.

2. Solve for x: $\log_5 x = 3$.

    a) $x = 15$

    b) $x = 25$

    c) $x = 125$

    d) $x = 625$

3. Evaluate $\log_{10} 1000$.

4. Express $\log_b(x^3)$ in terms of $\log_b(x)$.

5. If $\log_3(9) = x$, find the value of x.

    a) $x = 1$

    b) $x = 4$

    c) $x = 2$

    d) $x = 3$

6. Which of the following is equal to $\log(x) + \log(y)$?

a) $\log(x + y)$

b) $\log(xy)$

c) $\log\left(\frac{x}{y}\right)$

d) $\log(x - y)$

7. Solve the equation: $\ln(e^x) = 5$.

8. Simplify $2\log_2(6) - \log_2(3)$.

9. Which of the following is equal to $\log_a(1)$?

a) 0

b) 1

c) a

d) $\log_a(a)$

10. Express the following as a single logarithm: $4\log_b(2) - \log_b(8)$.

11. If $\log(2) = 0.3010$, what is $\log(20)$?

12. Evaluate $\log_{10}\left(\frac{1}{100}\right)$.

13. Solve for x: $\log_2(3x - 1) = 4$.

14. Simplify the expression: $\log_b(x^2) - 2\log_b(x)$.

15. If $2\log(x) = 5$, find x.

16. Convert the expression $\log_c(a)\log_c(b)$ into a single logarithm.

17. What is the value of x if $2^{\log_2(x)} = 16$?

a) 4

b) 8

c) 16

d) 32

18. Simplify $\frac{1}{2}\log_y(y^4)$.

19. Rewrite $\log_{10}(25) + \log_{10}(4)$ as a single logarithm.

20. For $\log\left(\frac{x}{5}\right) = 2$, solve for x.

Exponents and Radicals

1. **Simplify the expression: $2^3 \times 2^4$.**
   A. 2^{12}
   B. 2^7
   C. 128
   D. 14

2. **Evaluate: 3^{-2}.**
   A. $\frac{1}{9}$
   B. $\frac{1}{6}$
   C. 1
   D. 9

3. **Simplify the expression: $(x^2 y)^3$.**

A. x^6y

B. x^6y^3

C. x^5y^3

D. x^8y^3

4. **Multiply and simplify:** $(a^3b^2)(a^4b^5)$.

   A. a^7b^4

   B. a^7b^7

   C. $a^{12}b^{10}$

   D. a^8b^6

5. **Rationalize the denominator:** $\frac{1}{\sqrt{5}}$.

   A. $\frac{\sqrt{5}}{5}$

   B. $5\sqrt{5}$

   C. $\sqrt{5}$

   D. $\frac{1}{5\sqrt{5}}$

6. **Simplify:** $16^{\frac{3}{4}}$.

   A. 4

   B. 8

   C. 16

   D. 64

7. **Evaluate:** $\left(\frac{27}{8}\right)^{-2/3}$.

   A. $\frac{9}{4}$

   B. $\frac{16}{9}$

   C. $\frac{4}{9}$

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

8. **Solve for x:** $5^{2x} = 125$.

   A. $\frac{3}{2}$

   B. 2

   C. $\frac{5}{2}$

   D. 3

9. **Express in simplest radical form:** $\sqrt{50}$.

   A. $5\sqrt{2}$

   B. $10\sqrt{5}$

   C. $25\sqrt{2}$

   D. $\sqrt{5}$

10. **Simplify:** $\frac{1}{x^{-3}}$.

   A. x^3

   B. x^{-3}

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

   D. x

11. **Multiply:** $(3x^{-2}y^3)(2x^4y^{-1})$.

   A. $6x^2y^2$

   B. $6x^6y^2$

   C. $6x^2y^6$

   D. $6x^5y^5$

12. **Express as a single power of x:** $x^4 \cdot x^{-7}$.

   A. x^{-3}

   B. x^3

   C. x^{-28}

   D. x^{11}

13. **Simplify the expression:** $\sqrt{x^8}$.

   A. x^4

   B. x^8

   C. x^2

D. $4x$

14. **Divide and simplify:** $\frac{a^8 b^{-3}}{a^{-2} b^4}$.

    A. $a^{10} b^{-7}$

    B. $a^6 b^7$

    C. $a^{-10} b^{-7}$

    D. $a^{10} b^7$

15. **Convert the radical to an exponent form:** $\sqrt[3]{64}$.

    A. $64^{\frac{1}{3}}$

    B. 4

    C. $2^{4/3}$

    D. 8

16. **Simplify the expression:** $\left(\frac{x^3}{y^{-2}}\right)^{-1}$.

    A. $\frac{y^2}{x^3}$

    B. $\frac{x^{-3}}{y^2}$

    C. $\frac{y^{-2}}{x^{-3}}$

    D. $\frac{x^3}{y^2}$

17. **Rewrite in radical notation:** $x^{1/5}$.

    A. $\sqrt[5]{x}$

    B. $\sqrt{x}$

    C. x^5

    D. $\sqrt[10]{x}$

18. **Solve:** $16^{x/2} = \frac{1}{4}$.

    A. -1

    B. -2

    C. 1

    D. 2

19. **Evaluate:** $(125x^3)^{1/3}$.

    A. $5x$

    B. $5x^{1/3}$

    C. $25x$

    D. $15x^{1/3}$

20. **Simplify the expression:** $\frac{4x^{1/2}}{2x^{1/4}}$.

    A. $x^{1/4}$

    B. $2x^{1/4}$

    C. $2x^{1/2}$

    D. $2x^{3/4}$

Linear Inequalities

1. Solve the inequality: $2x - 5 > 3$.

   A. $x > 4$

   B. $x > 1$

   C. $x < 1$

   D. $x < 4$

2. Find the solution set for $3x + 7 < 2x - 5$.

   A. $x < -12$

   B. $x > -12$

   C. $x < 12$

   D. $x > 12$

3. Which of the following best represents the inequality $-4x$

$, \leq 16$?

A. $x \geq -4$
B. $x \leq -4$
C. $x \geq 4$
D. $x \leq 4$

4. Determine the solution of $x/3 + 2 > 5$.

A. $x > 9$
B. $x < 9$
C. $x > 3$
D. $x < 3$

5. Solve the inequality $5x - 7 \geq 2x + 8$.

A. $x \geq 5$
B. $x \leq 5$
C. $x \geq -5$
D. $x \leq -5$

6. Which of the following solutions satisfies $7 - 2x > 3$?

A. $x < 2$
B. $x > 2$
C. $x < -2$
D. $x > -2$

7. What is the solution to the inequality $3(x - 4) \leq 2(x + 1)$?

A. $x \leq 10$
B. $x \geq 10$
C. $x \leq -10$
D. $x \geq -10$

8. Solve the compound inequality $-3 < 2x - 1 \leq 5$.

9. Which inequality represents the set of all x such that $4(x - 3) \geq 12$?

A. $x \geq 6$
B. $x \leq 6$
C. $x \geq 3$
D. $x \leq 3$

10. Determine x for the inequality $\frac{x+2}{3} < 1$.

Quadratic Inequalities

1. **Solve the inequality:** $x^2 - 4x - 5 < 0$**.**
   A. $x > 5$ or $x < -1$
   B. $-1 < x < 5$
   C. $x > 0$
   D. $x < 3$
2. **Which of the following intervals represents the solution to the inequality $x^2 + 3x - 10 \geq 0$?**
   A. $(-\infty, -5] \cup [2, \infty)$
   B. $(-5, 2)$
   C. $(-\infty, -2) \cup (5, \infty)$
   D. $(-\infty, \infty)$
3. **Solve the inequality:** $2x^2 - 8x \leq 0$**.**
   A. $x \leq 4$

B. $x(x-4) \leq 0$

C. $0 \leq x \leq 4$

D. $x \geq 0$

4. **What is the solution set for** $3x^2 + 12x + 9 > 0$**?**

   A. $x < -3$ or $x > -1$

   B. $x > 0$ and $x < 3$

   C. $x < 3$ or $x > 5$

   D. $x < -1$

5. **Determine the values of** x **that satisfy** $x^2 - 9x + 14 \geq 0$**.**

   A. $(infty, 2] \cup [7, \infty)$

   B. $(infty, 2) \cup (7, \infty)$

   C. $[2, 7]$

   D. $(2, 7)$

6. **Solve:** $(x - 1)(x + 2) < 0$**.**

   A. $x < -2$ or $x > 1$

   B. $-2 < x < 1$

   C. $x < 1$

   D. $x > -2$

7. **If** $x^2 - 6x + 9 \leq 0$**, what are the possible values of** x**?**

   A. $x = 3$

   B. $x \leq 3$

   C. $x \geq 3$

   D. $x < 3$

   $textor x > 3$

8. **Find the solution set of** $x^2 + 2x - 8 > 0$**.**

   A. $x < -4$ or $x > 2$

   B. $-4 < x < 2$

   C. $x > -2$ and $x < 4$

   D. $x < 0$ or $x > 3$

9. **Which values satisfy** $x^2 - x - 12 < 0$**?**

   A. $x < -3$

   B. $-3 < x < 4$

   C. $x > 4$

   D. $x < 0$

   $textand x > 3$

10. **Solve for** $x : 4x^2 + 4x \leq 3$**.**

    A. $x \leq -\frac{3}{2}$

    B. $x \geq \frac{1}{2}$

    C. $-\frac{3}{2} \leq x \leq \frac{1}{2}$

    D. $x \geq 0$

11. **Find the intervals where** $x^2 - 2x - 15 \geq 0$**.**

    A. $[5, \infty)$

    B. $(-\infty, -3] \cup [5, \infty)$

    C. $(-\infty, 5]$

    D. $(-3, 5)$

12. **Solve:** $x^2 + x - 6 < 0$**.**

    A. $-3 < x < 2$

    B. $x < -3$ or $x > 2$

    C. $x > -2$ and $x < 3$

    D. $x = 0$

13. **If** $(x + 3)^2 > 16$**, what is the solution set for** x**?**

    A. $x < -7$ or $x > 1$

    B. $-7 < x < 1$

    C. $x > 4$ or $x < -4$

D. $x \leq -3$ and $x \leq 3$

14. **Determine the solution to the inequality $9 - 3x^2 < 0$.**
    A. $x < -3$ or $x > 3$
    B. $-3 < x < 3$
    C. $x = 0$
    D. $x > 0$

15. **Solve $x^2 - 5x + 6 \geq 0$.**
    A. $(infty, 2] \cup [3, \infty)$
    B. $x < -2$ or $x > 3$
    C. $[2, 3]$
    D. $x < 3$ and $x < 5$

Functions and Graphs

1. **Which of the following is the graph of the function $f(x) = x^2 - 4x + 3$?**
   A. Parabola opening upwards, vertex at (2, -1)
   B. Parabola opening downwards, vertex at (2, -1)
   C. Parabola opening upwards, vertex at (-2, 1)
   D. Parabola opening upwards, vertex at (1, 0)

2. **If $g(x) = \frac{1}{x-2}$, which of the following best describes the graph of $g(x)$?**
   A. Hyperbola with vertical asymptote $x = 2$
   B. Hyperbola with vertical asymptote $x = -2$
   C. Parabola with vertical asymptote $x = 2$
   D. Line with no asymptotes

3. **Find the x-intercepts of the function $h(x) = 2x^2 - 8x + 6$.**
   A. $x = 1$ and $x = 3$
   B. $x = 2$ and $x = 1$
   C. $x = 3$ and $x = -1$
   D. $x = 2$ and $x = 0$

4. **Which of the following functions has an axis of symmetry at $x = 4$?**
   A. $f(x) = (x - 4)^2 + 3$
   B. $g(x) = x^2 + 8x - 4$
   C. $h(x) = 2(x + 4)^2 - 5$
   D. $j(x) = -3(x - 4)^2 + 2$

5. **The graph of $f(x) = x^2 + 6x + 9$ is translated 3 units down. What is the new equation of the function?**
   A. $f(x) = x^2 + 6x + 6$
   B. $f(x) = x^2 + 6x + 12$
   C. $f(x) = x^2 + 6x + 9$
   D. $f(x) = x^2 + 6x + 15$

6. **Which of the following is the parent function of the function $f(x) = -2(x - 1)^2 + 4$?**
   A. $g(x) = x^2$
   B. $g(x) = -x^2$
   C. $g(x) = (x - 1)^2$
   D. $g(x) = -x^2 + 4$

7. **Identify the range of the function $k(x) = \sqrt{x + 3}$.**
   A. $y \geq 0$
   B. $y \geq -3$
   C. $y \leq 0$
   D. $y \geq 3$

8. **Find the inverse of the function $f(x) = 3x - 7$.**
   A. $f^{-1}(x) = \frac{x+7}{3}$
   B. $f^{-1}(x) = \frac{x-7}{3}$

C. $f^{-1}(x) = \frac{3}{x-7}$

D. $f^{-1}(x) = \frac{3}{x+7}$

9. **The function $f(x) = 2x - 5$ is reflected over the x-axis. What is the equation of the new function?**

    A. $f(x) = -2x - 5$

    B. $f(x) = 2x + 5$

    C. $f(x) = -2x + 5$

    D. $f(x) = 2x - 5$

10. **If $y = |x - 3|$, what is the graph of y if it is shifted left by 3 units?**

    A. $y = |x|$

    B. $y = |x - 6|$

    C. $y = |x + 3|$

    D. $y = |x - 0|$

11. **Evaluate the composition $f(g(x))$ if $f(x) = x^2 + 1$ and $g(x) = 3x - 2$ for $x = 0$.**

    A. 7

    B. 10

    C. 15

    D. 13

12. **What is the domain of the function $f(x) = \frac{1}{x^2-1}$?**

    A. All real numbers except $x = 1$

    B. All real numbers except $x = -1, 1$

    C. All real numbers except $x = 0$

    D. All real numbers except $x = -1$

13. **Which of the following transformations will shift the graph of $y = x^2$ vertically by 4 units?**

    A. $y = x^2 + 4$

    B. $y = x^2 - 4$

    C. $y = (x - 4)^2$

    D. $y = (x + 4)^2$

14. **Given $f(x) = x^3$, which statement is true about its graph?**

    A. The graph is symmetrical about the x-axis

    B. The graph is symmetrical about the origin

    C. The graph is symmetrical about the y-axis

    D. The graph is not symmetrical

15. **Find the vertex of the function $f(x) = 4x^2 - 16x + 13$.**

    A. (2, -3)

    B. (2, -5)

    C. (4, -6)

    D. (4, 16)

Composition and Inverse Functions

1. **If $f(x) = 3x + 2$ and $g(x) = x^2$, what is $(f \circ g)(x)$?**

    A. $3x^2 + 2$

    B. $3(x^2) + 2$

    C. $(3x + 2)^2$

    D. $(3(x + 2))^2$

2. **Given $f(x) = \sqrt{x - 1}$, find $(f \circ f)(x)$.**

3. **If $f(x) = 2x - 5$ and $g(x) = \frac{x+5}{2}$, what is $(f \circ g)(x)$?**

    A. x

    B. $2x$

    C. $x + 10$

D. $x - 5$

4. **Find the inverse of the function $f(x) = \frac{x-3}{4}$.**

5. **If $f(x) = x^3$ and $g(x) = \sqrt[3]{x}$, verify $f(g(x))$.**

   A. x
   B. x^3
   C. $x^{1/3}$
   D. $3x$

6. **Determine the inverse of $f(x) = x^2 + 5$ for $x \geq 0$.**

7. **Let $f(x) = \frac{1}{x}$ and $g(x) = x - 2$. Find $(g \circ f)(x)$.**

   A. $\frac{1}{x} - 2$
   B. $\frac{1}{x-2}$
   C. $\frac{1}{x} + 2$
   D. $\frac{1}{x+2}$

8. **Verify whether $h(x) = 2x + 1$ and $k(x) = \frac{x-1}{2}$ are inverses.**

   A. $h(k(x)) = x$
   B. $k(h(x)) = x$
   C. Both $h(k(x)) = x$ and $k(h(x)) = x$
   D. Neither are true

9. **If $f(x) = \frac{2x+3}{x-1}$, what is the expression for the inverse of $f(x)$?**

10. **Given $f(x) = ax + b$ and $g(x) = cx + d$, find $(g \circ f)(x)$.**

    A. $acx + ad + b$
    B. $acx + b + d$
    C. $(ax + b)(cx + d)$
    D. $c(ax + b) + d$

11. **Find the inverse function of $f(x) = \frac{3x+2}{x-4}$.**

12. **Determine $(f \circ f^{-1})(x)$ if $f(x) = \frac{5x-7}{2}$.**

13. **What is the domain of $f(x) = \frac{3x+1}{x^2-4}$?**

    A. $x \neq \pm 2$
    B. $x \neq 2$
    C. $x \geq 2$
    D. All real numbers

14. **If $f(x) = \frac{1}{x}$ and $g(x) = 2x + 3$, what is $(f \circ g)(x)$?**

    A. $\frac{1}{2x+3}$
    B. $2x + \frac{1}{3}$
    C. $\frac{x+3}{2}$
    D. $\frac{2}{x} + 3$

15. **Verify if the function $f(x) = 4x + 7$ has an inverse.**

Rational Expressions

1. **Simplify the rational expression:**

$$\frac{6x^2 - 12x}{3x}$$

a) $2x - 4$
b) $2x - 2$
c) $2x$
d) $2x - 3$

2. **If $f(x) = \frac{x^2-1}{x-1}$, what is the simplified form of $f(x)$ for $x \neq 1$?**
   a) $x + 1$
   b) $x - 1$
   c) $x^2 - 2x + 1$
   d) x

3. **Simplify the complex fraction:**

$$\frac{\frac{2}{x} + \frac{3}{y}}{\frac{1}{x^2} - \frac{1}{y^2}}$$

   a) $\frac{2xy+3x}{y-x}$
   b) $\frac{2y+3x^2}{y+x}$
   c) $\frac{2xy+3y^2}{x-y}$
   d) $\frac{2x+3y}{x+y}$

4. **Find the excluded values for the rational expression:**

$$\frac{x^2 + 5x + 6}{x^2 - 4}$$

   a) $x \neq 0, x \neq -2$
   b) $x \neq 2, x \neq -2$
   c) $x \neq 3, x \neq -2$
   d) $x \neq 2, x \neq -3$

5. **Solve the equation:**

$$\frac{2x}{x+3} = \frac{3x}{x+5}$$

   a) $x = 0, x = -15$
   b) $x = 0, x = 15$
   c) $x = 0, x = -5$
   d) $x = 0$

6. **Which of the following is equivalent to:**

$$\frac{x^2 - 9}{x^2 - 6x + 9}$$

   a) $x + 3$
   b) $x - 3$
   c) $\frac{x+3}{x-3}$
   d) $\frac{x-3}{x-3}$

7. **Simplify the rational expression:**

$$\frac{5x^3 - 10x^2}{5x^2}$$

   a) $x - 2$
   b) $x + 2$
   c) $5x - 2$
   d) $x^2 - 2$

8. **If $g(x) = \frac{2x+4}{x^2-4}$, what values of x must be excluded from the domain of $g(x)$?**
   a) $x \neq 2, x \neq -2$
   b) $x \neq 0, x \neq 4$
   c) $x \neq -2, x \neq 4$
   d) $x \neq 2, x \neq 0$

9. **Simplify:**

$$\frac{x^2 - 4x + 4}{x^2 - 4}$$

  a) $\frac{x-2}{x+2}$
  b) $\frac{x-2}{x-2}$
  c) $x - 2$
  d) $\frac{x+2}{x-2}$

10. **Determine the values for which the expression is undefined:**

$$\frac{x^2 + x - 6}{x^2 - x - 12}$$

a) $x = -3, x = 4$

b) $x = 3, x = -4$

c) $x = 2, x = -6$

d) $x = 3, x = -3$

Polynomial Division

1. **Divide:** $\frac{x^3 + 3x^2 - 4x + 5}{x - 1}$

   A. $x^2 + 4x + 1 + \frac{6}{x-1}$
   B. $x^2 + 2x + 1$
   C. $x^2 + 2x - 1 + \frac{6}{x-1}$
   D. $x^2 + 3x - 1 + \frac{6}{x-1}$

2. **Divide:** $\frac{2x^4 - 3x^2 + x - 2}{x + 2}$

3. **What is the remainder when $2x^3 - x^2 + 4x - 5$ is divided by $x - 3$?**

   A. 15
   B. 10
   C. 5
   D. -5

4. **Divide:** $\frac{4x^3 + 0x^2 - 5x + 3}{2x - 1}$

   A. $2x^2 + \frac{x-3}{2x-1}$
   B. $2x^2 + x - 2 + \frac{5}{2x-1}$
   C. $2x^2 + \frac{x+3}{2x-1}$
   D. $2x^2 + x - 2$

5. **If the polynomial $p(x) = x^3 - 6x^2 + 11x - 6$ is divided by $x - 2$, find the remainder.**

6. **Find:** $\frac{x^4 + x^3 - 2x + 1}{x + 1}$

   A. $x^3 - x^2 + x - 1 + \frac{2}{x+1}$
   B. $x^3 + x^2 + x - 2 + \frac{3}{x+1}$
   C. $x^3 + x^2 - 2$
   D. $x^3 - x^2 + x - 2 + \frac{3}{x+1}$

7. **Solve:** $\frac{x^5 - x^4 - x^2 + 1}{x^2 - 1}$

8. **What is the quotient of $\frac{3x^3 + 6x^2 - 9x}{3x}$?**

   A. $x^2 + 2x - 3$

B. $x^2 + 2x + 3$
C. $x^2 + x - 3$
D. $x^2 - x - 3$

9. **When $x^6 + 2x^5 - x^4 + x^3 - 6x + 3$ is divided by $x^2 + 1$, find the quotient.**

10. **Divide the polynomial $2x^3 - 5x^2 + 4x - 1$ by $x - 1$. Initially, compute the remainder.**

11. **Calculate:** $\frac{5x^4 - x^3 + x - 8}{x^2 + 2}$

12. **When $x^4 - x^2 + 3x - 4$ is divided by $x + 3$, find the quotient and remainder.**

13. **What is the result of the division $\frac{9x^3 - 3x^2 + 6x - 12}{3x + 1}$?**

A. $3x^2 - 2x + 2$
B. $3x^2 - x + 3$
C. $3x^2 - x - 3$
D. $3x^2 + x + 4$

Binomial Theorem

1. **Expand the expression using the Binomial Theorem:**

$$(x + 3)^4$$

A. $x^4 + 12x^3 + 36x^2 + 81x + 81$
B. $x^4 + 12x^3 + 54x^2 + 108x + 81$
C. $x^4 + 9x^3 + 27x^2 + 54x + 81$
D. $x^4 + 18x^3 + 54x^2 + 81x + 81$

2. **What is the third term in the expansion of**

$$(2y - 1)^5$$

using the Binomial Theorem?

A. $-40y^3$
B. $40y^3$
C. $-160y^3$
D. $160y^3$

3. **Using the Binomial Theorem, find the coefficient of x^5 in the expansion of**

$$(3x - 2)^7$$

.

A. 6720
B. 3360
C. -3360
D. -6720

4. **Express**

$$(a + b)^6$$

using the Binomial Theorem. What is the fifth term of the expansion?

A. $15a^2b^4$
B. $6a^2b^4$
C. $20a^2b^4$

D. $40a^2b^4$

5. **Determine the middle term of the expansion of**

$$(x - 3y)^8$$

using the Binomial Theorem.

6. **Calculate the coefficient of x^8 in the expansion of**

$$(2x + 1)^{10}$$

.

7. **For the binomial**

$$(3s - 2t)^5$$

, find the coefficient of the term s^3t^2 in the expansion.

A. -120
B. 120
C. -240
D. 240

8. **If**

$$(x + y)^{10}$$

is expanded, how many terms will the expansion contain?

A. 10
B. 11
C. 12
D. 9

9. **Using the Binomial Theorem, find the sum of the coefficients in the expansion of**

$$(x - 2)^7$$

.

10. **In the expansion of**

$$(5p + 4q)^6$$

, what is the fourth term?

A. $80p^3q^3$
B. $320p^3q^3$
C. $400p^3q^3$
D. $960p^3q^3$

11. **Find the 7th term in the expansion of**

$$(x + 2)^{10}$$

using the Binomial Theorem.

12. **Determine the coefficient of r^{11} in the expansion of**

$$(1 + r)^{20}$$

using the Binomial Theorem.

Factorization Methods

1. **Factor the expression completely:** $x^2 - 9x + 20$

   A. $(x - 4)(x - 5)$
   B. $(x + 4)(x + 5)$
   C. $(x + 5)(x - 4)$
   D. $(x - 4)(x + 5)$

2. **Factor the polynomial $x^3 - 27$.**

3. **Which of the following is a factor of $2x^2 + 7x + 3$?**

   A. $(2x + 1)$
   B. $(x + 3)$
   C. $(2x - 3)$
   D. $(x - 2)$

4. **Factor $4x^2 - 25$ completely.**

5. **What is the factorization of $x^2 + 6x + 9$?**

   A. $(x + 3)^2$
   B. $(x + 3)(x - 3)$
   C. $(x + 9)$
   D. $(x - 3)^2$

6. **Factor the trinomial completely:** $6x^2 + 11x + 4$.

7. **Which of the following expressions is equivalent to $x^3 + 2x^2 - x - 2$ when factored completely?**

   A. $(x^2 + 1)(x + 2)$
   B. $(x + 2)(x^2 - 1)$
   C. $(x + 2)(x - 1)^2$
   D. $(x - 1)(x + 2)(x + 1)$

8. **If one of the factors of $2x^3 - 3x^2 - 8x + 12$ is $(x - 2)$, what is the other factor?**

9. **Factor the expression $x^2 - 4x + 4$.**

   A. $(x - 2)^2$
   B. $(x + 2)^2$
   C. $(x - 4)(x - 1)$
   D. $(x - 2)(x + 2)$

10. **What is the complete factorization of $x^4 - 1$?**

11. **Factor completely:** $3x^2 - 12x + 12$.

12. **Factor the polynomial:** $x^2 - 5x - 14$.

A. $(x + 2)(x - 7)$
B. $(x - 2)(x + 7)$
C. $(x + 7)(x - 2)$
D. $(x - 7)(x + 2)$

13. **Which of the following is the factorization of $4x^2 - x - 15$?**

A. $(2x + 3)(2x - 5)$
B. $(4x + 5)(x - 3)$
C. $(2x - 3)(x + 5)$
D. $(4x - 3)(x + 5)$

14. **Factor $x^2 - 2x - 15$ completely.**

15. **What is the factorization of the expression $9x^2 - 1$?**

A. $(3x + 1)^2$
B. $(3x - 1)(3x + 1)$
C. $(3x - 1)^2$
D. $(3x + 1)(3x - 1)$

Synthetic Division

1. **Use synthetic division to divide the polynomial $2x^3 - 3x^2 + 4x - 5$ by $x - 2$. What is the remainder?**

   A. 1

   B. 3

   C. 5

   D. 7

2. **Perform synthetic division on $x^3 + 2x^2 - x + 3$ by $x + 1$. What is the resulting polynomial?**

3. **If you divide $3x^3 - 5x^2 + 2x - 8$ by $x - 3$ using synthetic division, what is the remainder?**

4. **What is the quotient when $4x^3 - x^2 - 12x + 9$ is divided by $x - 1$ using synthetic division?**

   A. $4x^2 + 3x - 9$

   B. $4x^2 - 3x + 9$

   C. $4x^2 - x + 2$

   D. $4x^2 - x - 3$

5. **Using synthetic division, determine if $x = 2$ is a root of the polynomial $x^3 - 4x^2 + 6x - 8$.**

6. **Divide $5x^4 - 3x^3 + 0x^2 + 2x - 1$ by $x - 2$ using synthetic division and identify the remainder.**

7. **Perform synthetic division on $2x^4 + 3x^2 - 5x + 1$ by $x - 1$. What is the quotient?**

8. **What is the remainder when $6x^3 + 2x^2 - 9x + 5$ is divided by $x + 3$ using synthetic division?**

   A. -58

   B. 58

   C. -48

   D. 48

9. **Use synthetic division to verify if $x + 2$ is a factor of the polynomial $x^4 + 4x^3 + x + 2$.**

10. **Divide $x^4 - 2x^3 + 3x - 4$ by $x - 1$ using synthetic division. What polynomial results?**

11. **Determine the remainder when $7x^3 - 6x^2 + x + 8$ is divided by $x - 1$.**

12. **If $x = -1$ is substituted into the polynomial $2x^3 - 5x^2 + 4x - 1$, would synthetic division show $x + 1$ as a factor? Verify using synthetic division.**

13. Use synthetic division to find the result when $3x^3 + x^2 - 12x + 4$ is divided by $x - 4$.

14. Perform synthetic division to determine the quotient of $x^3 - 3x^2 + 5x - 7$ divided by $x - 2$. What is the quotient?

15. Through synthetic division, find the remainder when $2x^3 - x^2 - 2x + 1$ is divided by $x + 1$.

Complex Conjugates

1. **Find the conjugate of the complex number $3 + 4i$.**

   A. $3 - 4i$

   B. $-3 + 4i$

   C. $3 + 4i$

   D. $-3 - 4i$

2. **What is the product of the complex number $5 + 6i$ and its conjugate?**

   A. -61

   B. -11

   C. 11

   D. 61

3. **If $z = 2 - 3i$, what is the complex conjugate of z?**

   A. $2 + 3i$

   B. $-2 - 3i$

   C. $-2 + 3i$

   D. $2 - 3i$

4. **Compute the conjugate of the complex number $-7 - 9i$.**

   A. $-7 + 9i$

   B. $7 - 9i$

   C. $-7 - 9i$

   D. $7 + 9i$

5. **Express $\$$**

   rac{2}{1 + i}$ in the form $a + bi$ by using the conjugate of the denominator.

6. **Find the conjugate of the complex number $-5 + 2i$.**

   A. $5 - 2i$

   B. $-5 + 2i$

C. $5 + 2i$

D. $-5 - 2i$

7. **If a complex number is written as $a + bi$, what is the form of its complex conjugate?**

   A. $a - bi$

   B. $-a + bi$

   C. $a + bi$

   D. $-a - bi$

8. **If $w = 4i$, what is the conjugate of w?**

   A. $-4i$

   B. $4i$

   C. $4 - i$

   D. $4 + i$

9. **Which of the following complex numbers is equal to its conjugate?**

   A. 7

   B. $5i$

   C. $3 + 2i$

   D. $0 + 9i$

10. **What is the result of multiplying $(6 - 2i)$ by its conjugate?**

    A. $36 + 4i$

    B. $36 - 12i$

    C. 40

    D. $40 - 12i$

11. **Determine the product of a complex number $3 - 7i$ and its conjugate.**

12. **Find the conjugate of 9.**

    A. 9

    B. -9

    C. $9i$

    D. $-9i$

13. **Simplify the expression $(1 + 2i)(1 - 2i)$.**

    A. $5i$

B. 5

C. −5

D. −5i

Graphing Polynomials

1. **Which of the following best describes the graph of the polynomial $P(x) = x^3 - 6x^2 + 9x$?**

   A. A line
   B. A parabola
   C. A cubic curve with a local maximum and minimum
   D. A straight line through the origin

2. **Consider the polynomial $f(x) = (x-2)^2(x+3)$. How many x-intercepts does the graph of this polynomial have?**

   A. 1
   B. 2
   C. 3
   D. None

3. **The graph of which of the following polynomials has a turning point?**

   A. $y = x^2 - 4x + 4$
   B. $y = x + 4$
   C. $y = x^3 - 3x + 1$
   D. $y = 6x - 5$

4. **Identify the end behavior of the polynomial $P(x) = -2x^4 + x^3 - 5x + 7$.**

   A. Both ends up
   B. Both ends down
   C. Left end up, right end down
   D. Left end down, right end up

5. **Which of the following could be the degree of a polynomial with exactly four turning points?**

   A. 2
   B. 3
   C. 4
   D. 5

6. **Given the polynomial $y = x^3 - 3x^2 - 4x + 12$, what is the y-intercept?**

7. **If a polynomial $f(x)$ is even, which of the following must be true about its graph?**

   A. Symmetrical about the x-axis
   B. Symmetrical about the y-axis
   C. Symmetrical about the origin
   D. No symmetry

8. **The graph of the polynomial $y = x^4 - 4x^2$ intersects the x-axis at which points?**

   A. $x = 0, x = 2, x = -2$
   B. $x = 0, x = -2$
   C. $x = 0, x = 2$
   D. $x = 0$

9. **Which polynomial has a graph that does not touch or cross the x-axis?**

   A. $f(x) = x^2 + 1$
   B. $g(x) = x(x - 3)$
   C. $h(x) = x^3 + x$
   D. $j(x) = (x - 2)^2$

10. **Given $p(x) = 2(x - 1)(x + 2)^2$, how many distinct real roots does the graph have?**

A. 1
B. 2
C. 3
D. None

11. **Which of the following polynomials has an odd degree?**

A. $y = x^3 - x^2 + x - 1$
B. $y = x^2(x - 2)(x + 1)$
C. $y = (x - 1)(x + 2)^2$
D. $y = x^4 + x^2 - 6$

12. **For the polynomial function $f(x) = -3x^5 + x - 2$, what is the end behavior of the graph?**

A. Rises to the left, falls to the right
B. Falls to the left, rises to the right
C. Falls to the left and right
D. Rises to the left and right

13. **How many local extrema are possible for the polynomial $g(x) = 6x^5 - 2x^3 + x - 4$?**

A. 2
B. 3
C. 4
D. 5

14. **What is the leading coefficient of the polynomial $h(x) = -4x^6 + 9x^5 - x + 12$?**

15. **Determine the degree of the polynomial $P(x) = (x^3 - x^2 + 2)^2$.**

Conic Sections

1. **Identify the conic section represented by the equation: $4x^2 + 9y^2 = 36$.**

   A. Circle
   B. Ellipse
   C. Parabola
   D. Hyperbola

2. **Which conic section is described by the equation: $x^2 - 4y^2 = 16$?**

   A. Ellipse
   B. Hyperbola
   C. Circle
   D. Parabola

3. **Find the center and radius of the circle given by the equation $(x + 3)^2 + (y - 4)^2 = 49$.**

4. **What is the equation of a parabola with vertex at $(0, 0)$ and focus at $(0, 3)$?**

5. **Given the equation of an ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$, determine the lengths of the major and minor axes.**

6. **Which of the following equations represents a hyperbola?**

   A. $\frac{x^2}{9} + \frac{y^2}{4} = 1$
   B. $\frac{x^2}{16} - \frac{y^2}{4} = 1$
   C. $(x-2)^2 + (y+3)^2 = 16$
   D. $3x^2 + 4y^2 = 12$

7. **Determine the vertices of the ellipse given by the equation $9x^2 + 4y^2 = 36$.**

8. **Convert the standard form of the ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$ to its general form.**

9. **Find the equation of a circle with a diameter that has endpoints at $(2, -3)$ and $(8, 5)$.**

10. **What is the eccentricity of the hyperbola defined by the equation $4x^2 - 25y^2 = 100$?**

11. **Which equation represents a parabola with a focus at $(4, 0)$ and directrix $x = -4$?**

A. $y^2 = 16x$
B. $(x-4)^2 = 8y$
C. $(y-2)^2 = 16(x-2)$
D. $x^2 = 8y$

12. **For the hyperbola $\frac{(x-5)^2}{9} - \frac{(y+2)^2}{4} = 1$, determine the center and the length of the transverse axis.**

13. **If the equation of a parabola is $y = 2x^2 + 4x + 1$, what are the coordinates of its vertex?**

14. **Evaluate the latus rectum of the parabola given by the equation $4x^2 = 9y$.**

15. **Find the foci of the ellipse described by the equation $\frac{x^2}{49} + \frac{y^2}{25} = 1$.**

Parabolas and Hyperbolas

1. **Identify the vertex of the parabola given by the equation $y = 2(x-3)^2 + 4$.**

   A. (3, 4)
   B. (-3, 4)
   C. (3, -4)
   D. (-3, -4)

2. **What is the equation of a parabola with a vertex at (2, -1) and a focus at (2, 1)?**

3. **Determine the equation of a hyperbola centered at the origin with a transverse axis of length 8 and a conjugate axis of length 6.**

   A. $\frac{x^2}{16} - \frac{y^2}{9} = 1$
   B. $\frac{x^2}{64} - \frac{y^2}{36} = 1$
   C. $\frac{x^2}{36} - \frac{y^2}{16} = 1$
   D. $\frac{x^2}{9} - \frac{y^2}{16} = 1$

4. **The equation $4x^2 - y^2 = 16$ represents a hyperbola. What are the lengths of its transverse and conjugate axes?**

5. **Find the vertices of a hyperbola given by $\frac{(x-2)^2}{36} - \frac{(y+3)^2}{16} = 1$.**

   A. (2, 3) and (2, -9)
   B. (-4, -3) and (8, -3)
   C. (8, -3) and (8, 3)
   D. (2, 0) and (2, -6)

6. **What is the eccentricity of the hyperbola defined by $9y^2 - 4x^2 = 36$?**

7. **Which of the following is the equation of a parabola that opens downward and has a vertex at (-5, 2)?**

    A. $y = -(x+5)^2 + 2$
    B. $y = (x+5)^2 - 2$
    C. $y = -2(x+5)^2 + 2$
    D. $y = 2(x-5)^2 - 2$

8. **The equation $x^2 + 4y^2 - 8x + 16y = 0$ is a conic section. Identify the type of conic section and its center.**

9. **Convert the equation of the parabola $y = 3x^2 - 6x + 5$ into vertex form.**

10. **A hyperbola has the equation $x^2 - \frac{y^2}{16} = 1$. Find the distance between its foci.**

Ellipses and Circles

1. **What is the standard form equation of a circle with its center at (3, -2) and radius 5?**

    A. $(x-3)^2 + (y+2)^2 = 5$
    B. $(x-3)^2 + (y+2)^2 = 25$
    C. $(x+3)^2 + (y-2)^2 = 25$
    D. $(x+3)^2 + (y-2)^2 = 5$

2. **If the equation of a circle is $x^2 + y^2 + 6x - 4y + 9 = 0$, what is the center and radius of the circle?**

    A. Center: $(-3, 2)$; Radius: 2
    B. Center: $(3, -2)$; Radius: 4
    C. Center: $(-3, 2)$; Radius: 4
    D. Center: $(3, -2)$; Radius: 2

3. **Determine the equation of the ellipse with vertices at $(ext{-}4, 0)$ and $(4, 0)$ and co-vertices at $(0, ext{-}2)$ and $(0, 2)$.**

    A. $\frac{x^2}{16} + \frac{y^2}{4} = 1$
    B. $\frac{x^2}{4} + \frac{y^2}{16} = 1$
    C. $\frac{x^2}{8} + \frac{y^2}{4} = 1$
    D. $\frac{x^2}{16} + \frac{y^2}{8} = 1$

4. **What is the equation of a circle with diameter endpoints at $(1, 5)$ and $(7, 11)$?**

    A. $(x-4)^2 + (y-8)^2 = 18$
    B. $(x-4)^2 + (y-8)^2 = 36$
    C. $(x-3)^2 + (y-6)^2 = 18$
    D. $(x-4)^2 + (y-6)^2 = 18$

5. **Which of the following is the equation of a circle centered at the origin with a radius of 10?**

    A. $x^2 + y^2 = 5$
    B. $x^2 + y^2 = 100$
    C. $(x-10)^2 + (y-10)^2 = 1$
    D. $x^2 - y^2 = 100$

6. **Given the ellipse equation $9x^2 + 16y^2 = 144$, what are the lengths of the major and minor axes?**

    A. Major: 8, Minor: 6
    B. Major: 6, Minor: 8

C. Major: 10, Minor: 8
D. Major: 8, Minor: 10

7. **If a circle has the equation $(x+2)^2 + (y-3)^2 = 49$, what are the coordinates of the center and the length of the radius?**

   A. Center: $(2,-3)$; Radius: 7
   B. Center: $(-2,3)$; Radius: 49
   C. Center: $(-2,3)$; Radius: 7
   D. Center: $(2,3)$; Radius: 7

8. **Find the eccentricity of an ellipse given by the equation $4x^2 + 9y^2 = 36$.**

   A. $\frac{1}{2}$
   B. $\frac{2}{3}$
   C. $\frac{\sqrt{5}}{3}$
   D. $\frac{\sqrt{5}}{2}$

9. **Convert the equation $x^2 + y^2 - 4x + 6y - 23 = 0$ to standard form. What are the center and radius of the circle?**

10. **An ellipse has a center at $(0,0)$, a semi-major axis of length 5 along the x-axis, and a semi-minor axis of length 3. What is its equation?**

   A. $\frac{x^2}{25} + \frac{y^2}{9} = 1$
   B. $\frac{x^2}{9} + \frac{y^2}{25} = 1$
   C. $\frac{x^2}{5} + \frac{y^2}{3} = 1$
   D. $\frac{x^2}{3} + \frac{y^2}{5} = 1$

Transformations of Functions

1. Which of the following transformations will shift the graph of $y = f(x)$ up by 3 units?
   a) $y = f(x) + 3$
   b) $y = f(x) - 3$
   c) $y = f(x + 3)$
   d) $y = f(x - 3)$
2. The graph of $y = f(x - 2)$ represents which transformation of $y = f(x)$?
   a) Shift 2 units left
   b) Shift 2 units right
   c) Reflection over the x-axis
   d) Reflection over the y-axis
3. How will the graph of $y = 2f(x)$ differ from the graph of $y = f(x)$?
   a) Shifted up by 2 units
   b) Compressed vertically by a factor of 2
   c) Stretched vertically by a factor of 2
   d) Reflected over the x-axis
4. The equation $y = f(x) - 5$ will result in which transformation of the graph of $y = f(x)$?
   a) Shift down by 5 units
   b) Shift up by 5 units
   c) Shift right by 5 units
   d) Shift left by 5 units
5. What transformation occurs for the graph of $y = f(3x)$ compared to the graph of $y = f(x)$?
   a) Vertical stretch by a factor of 3
   b) Vertical compression by a factor of 3
   c) Horizontal stretch by a factor of 3

    d) Horizontal compression by a factor of 3
6. Describe the transformation of the graph $y = -f(x)$.
    a) Vertical reflection
    b) Horizontal reflection
    c) Shift left by 1 unit
    d) Shift right by 1 unit
7. If the function $y = f(x)$ is transformed to $y = f(x) + 7$, what transformation occurs?
    a) The graph is shifted 7 units up
    b) The graph is shifted 7 units down
    c) The graph is shifted 7 units to the right
    d) The graph is shifted 7 units to the left
8. The transformation $y = \frac{1}{2}f(x)$ results in which of the following changes?
    a) Vertical stretch by a factor of $\frac{1}{2}$
    b) Vertical compression by a factor of $\frac{1}{2}$
    c) Horizontal stretch by a factor of $\frac{1}{2}$
    d) Horizontal compression by a factor of $\frac{1}{2}$
9. What transformation is represented by $y = f(-x)$ for a given function $y = f(x)$?
    a) Shift left by 2 units
    b) Shift right by 2 units
    c) Reflection over the x-axis
    d) Reflection over the y-axis
10. How does the graph of $y = f(x + 4)$ compare to the graph of $y = f(x)$?
    a) Shift up by 4 units
    b) Shift down by 4 units
    c) Shift left by 4 units
    d) Shift right by 4 units
11. Which transformation will result in a graph that is a vertical stretch by a factor of 3?
    a) $y = 3f(x)$
    b) $y = f(3x)$
    c) $y = \frac{1}{3}f(x)$
    d) $y = f(x) + 3$
12. What is the effect of the transformation $y = f(x) - c$ for a constant $c > 0$ on the graph of $y = f(x)$?
    a) Shift up by c units
    b) Shift down by c units
    c) Shift left by c units
    d) Shift right by c units

Piecewise Functions

1. **Evaluate the function $f(x)$ at $x = 2$, where**

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 3x + 1 & \text{if } 0 \leq x \leq 2 \\ x - 4 & \text{if } x > 2 \end{cases}$$

    A. 5
    B. 7
    C. 9
    D. 10

2. **Which of the following defines a piecewise function**

    A. $f(x) = 3x + 2$
    B. $f(x) = |x|$

C. $f(x) = \begin{cases} 2x & \text{if } x \leq 5 \\ x^2 & \text{if } x > 5 \end{cases}$

D. $f(x) = \frac{x}{x-1}$

3. **Determine the value of $f(-1)$ given**

$$f(x) = \begin{cases} x + 2 & \text{if } x \leq -1 \\ -x^2 & \text{if } x > -1 \end{cases}$$

4. **What is $g(3)$ if**

$$g(x) = \begin{cases} -2x + 1 & \text{if } x < 0 \\ x^2 - 4 & \text{if } 0 \leq x < 5 \\ 3x + 2 & \text{if } x \geq 5 \end{cases}$$

5. **For what values of x is $h(x)$ undefined if**

$$h(x) = \begin{cases} \frac{1}{x+2} & \text{if } x \neq -2 \\ 5 & \text{if } x = -2 \end{cases}$$

A. $x = 2$
B. $x = -2$
C. $x = 0$
D. $x = $ no value, it is always defined

6. **Find the limit as x approaches 0 from the left of $f(x)$, where**

$$f(x) = \begin{cases} 3x^2 & \text{if } x \leq 0 \\ 2x + 1 & \text{if } x > 0 \end{cases}$$

7. **Evaluate the function $f(x)$ at $x = -3$, where**

$$f(x) = \begin{cases} 4x + 6 & \text{if } x < 0 \\ x^2 & \text{if } 0 \leq x \leq 5 \end{cases}$$

8. **Determine the expression for $f(x)$ on the interval $x > 0$, where**

$$f(x) = \begin{cases} 3 - 4x & \text{if } x \leq 0 \\ 2x^2 + 1 & \text{if } x > 0 \end{cases}$$

9. **Identify the range of the function $f(x)$ given by**

$$f(x) = \begin{cases} -x & \text{if } x < -1 \\ x^2 - 1 & \text{if } x \geq -1 \end{cases}$$

A. $(-\infty, 1]$
B. $[0, \infty)$
C. $(-\infty, \infty)$
D. $(-1, \infty)$

10. **Compute $f(0)$ if**

$$f(x) = \begin{cases} 2x + 3 & \text{if } x < 0 \\ x^2 - x & \text{if } x \geq 0 \end{cases}$$

Asymptotes and Discontinuities

1. **Identify the vertical asymptotes of the function** $f(x) = \frac{x^2-4}{x^2-5x+6}$.

2. **Determine the horizontal asymptote of the function** $g(x) = \frac{3x^2+2x+1}{x^2-x+1}$.

   A. $y = 1$
   B. $y = 3$
   C. $y = 0$
   D. No horizontal asymptote

3. **Find the vertical asymptote of** $h(x) = \ln(x-3)$.

4. **What is the horizontal asymptote of** $k(x) = \frac{5x+4}{x-1}$?

   A. $y = 5$
   B. $y = 1$
   C. $y = -1$
   D. No horizontal asymptote

5. **Calculate the vertical asymptotes for the rational function** $m(x) = \frac{x+2}{(x-1)(x+3)}$.

6. **For the function** $p(x) = \frac{2x^3+3x+1}{x^2+x-2}$, **determine any horizontal asymptotes.**

7. **Identify any discontinuities of the function** $q(x) = \frac{x^2-9}{x-3}$.

8. **What are the vertical asymptotes of the function** $r(x) = \frac{1}{x^2-9}$?

   A. $x = 3$
   B. $x = -3$
   C. $x = 3$ and $x = -3$
   D. No vertical asymptotes

9. **Find the equation of the horizontal asymptote for the function** $s(x) = \frac{4x^2-x+5}{2x^2+3x+1}$.

   A. $y = 2$
   B. $y = 4$
   C. $y = \frac{5}{3}$
   D. $y = 1$

10. **Determine any removable discontinuities of** $t(x) = \frac{x^3-x}{x^2-1}$.

11. **Identify the vertical asymptotes of the function** $u(x) = \frac{7}{x^2+x-6}$.

12. **If a function is defined by** $v(x) = \frac{3x^2+x-2}{x^2-x-6}$, **what are the asymptotes?**

13. **What type of discontinuity does the function** $w(x) = \frac{x^2-4x}{x^2-4}$ **have?**

14. **Calculate the vertical and horizontal asymptotes of** $y(x) = \frac{x^3+x}{x^2-x}$.

15. **For the function** $z(x) = \frac{x^2-16}{x^2+4x-12}$, **find any vertical asymptotes and discontinuities.**

Logarithmic Equations

1. **Solve for** x: $\log_3(x) = 4$.

   A. 27
   B. 64
   C. 81
   D. 243

2. **If** $\log(x) + \log(5) = 2$, **find the value of** x.

3. **Solve for x: $\log_2(x - 3) = 5$.**

   A. 29
   B. 32
   C. 35
   D. 37

4. **Find the value of x that satisfies $\log_5(2x + 3) = 2$.**

5. **Solve $\log_{10}(2x) = \log_{10}(3x - 5)$.**

6. **If $\log_2(x) + \log_2(x - 4) = 3$, what is x?**

   A. 4
   B. 8
   C. 16
   D. 32

7. **What is the solution to $\log_4(2x + 1) = 3$?**

8. **Determine the value of x: $2\log(x) = 4$.**

9. **If $\log_a(x^2) = 6$ and $a > 0, a \neq 1$, find x.**

10. **Solve for x: $\log_7(x + 1) = \log_7(5) + \log_7(3)$.**

A. 1
B. 10
C. 14
D. 15

11. **Calculate x for $\log_9(x - 2) + \log_9(x + 2) = 1$.**

12. **If $\log_{1/3}(x - 1) = -2$, what is x?**

13. **Find x such that $\log_6(x) - \log_6(3) = 1$.**

A. 2
B. 6
C. 12
D. 18

14. **Determine the value of x in the equation $\log(x) = \frac{1}{2}$.**

15. **If $\log_5(x^2) = \log_5(25)$, what is x?**

16. **Solve for x: $\log_4(x^2 + 2) = 3$**

17. **If $\log_b(\frac{x}{2}) = 3$, find the expression for x.**

18. **Find x in $\log_2(x^2) = \log_2(32)$.**

19. **Solve $\log_3(9x) = \log_3(81)$.**

A. $\frac{9}{4}$
B. 9
C. 27
D. 81

20. **If $2\log_7(x) = 4$, what is x?**

Exponential Equations

1. Solve for x:
$$2^x = 16$$

   a) 2
   b) 3
   c) 4
   d) 5

2. What is the value of x in the equation
$$3^{2x} = 81$$
?

   a) 1
   b) 2
   c) 3
   d) 4

3. Find x:
$$5^{x-1} = 125$$

   a) 2
   b) 3
   c) 4
   d) 5

4. Determine x if
$$4^x = 1/64$$
.

   a) -1
   b) -2
   c) -3
   d) -4

5. Solve for x:
$$6 \times 2^x = 48$$

   a) 1
   b) 2
   c) 3
   d) 4

6. If
$$9^{x+1} = 27$$
, what is x?
   a) -1
   b) $-\frac{2}{3}$
   c) 0
   d) $\frac{1}{3}$

7. Solve the equation for x:
$$16^x = 2^{12}$$

   a) 2
   b) 3
   c) 4
   d) 6

8. What is the solution for x:
$$8^{2x} = 4^{x+2}$$
?

a) 0
b) 1
c) 2
d) 3

9. Solve for x in the equation

$$10^{3x} = 1000$$

.

a) 1
b) 2
c) 3
d) 4

10. Determine the value of x such that

$$2 imes 5^x = 250$$

.

a) 1
b) 2
c) 3
d) 4

11. Find x if

$$3^x = \frac{1}{27}$$

.

a) -1
b) -2
c) -3
d) -4

12. What is x when

$$7^{2x} = 343$$

?

a) 1
b) 1.5
c) 2
d) 2.5

13. Solve for x:

$$5^{x+2} = 1250$$

a) 1
b) 2
c) 3
d) 4

14. If

$$2^{3x} = 64$$

, what is the value of x?

a) 2
b) 3
c) 4
d) 5

15. Determine x such that

$$81^x = 27^{2x-1}$$

.

a) 0.5
b) 1
c) 1.5
d) 2

Interest Growth and Decay

1. **If you invest $5,000 at an annual interest rate of 4% compounded annually, what will be the total amount after 3 years?**

   A. $5,600
   B. $5,616.32
   C. $5,624.32
   D. $5,648.98

2. **The population of a town increases at a steady rate of 2% per year. If the current population is 50,000, what will be the population in 5 years?**

3. **A car was purchased for $20,000. If its value depreciates by 15% per year, what will be its approximate value after 4 years?**

   A. $10,150.50
   B. $11,145.00
   C. $11,960.25
   D. $12,123.45

4. **An investment account earns an annual interest rate of 6% compounded monthly. What is the effective annual rate (EAR)?**

   A. 6.17%
   B. 6.18%
   C. 6.19%
   D. 6.20%

5. **You invest $1,000 in a savings account with an annual interest rate of 1.5%, compounded annually. How much will you have in the account after 10 years?**

6. **A radioactive substance decays at a continuous rate of 5% per year. If the initial amount is 20 grams, how much will remain after 8 years?**

7. **The cost of an item is subject to an annual inflation rate of 3%. If the current cost is $200, calculate the cost after 3 years.**

   A. $218.55
   B. $218.27
   C. $218.36
   D. $218.45

8. **Find the future value of $1,200 at an annual interest rate of 5%, compounded quarterly, after 5 years.**

9. **A certain bacteria culture doubles every 3 hours. If there are initially 200 bacteria, how many bacteria will be present after 12 hours?**

10. **If an amount of money triples in 9 years at a constant growth rate, what is the annual growth rate?**

A. 10.3%
B. 11.6%
C. 12.9%
D. 13.7%

11. **An investment account grows by 8% annually. How many years will it take for the investment to quadruple?**

A. 12 years
B. 15 years

C. 18 years

D. 19 years

12. **A certain loan charges 7% interest per annum, compounded semiannually. What is the effective annual rate (EAR) of the loan?**

A. 7.12%

B. 7.14%

C. 7.18%

D. 7.20%

13. **The population of a city decreases by 2% per year. If the current population is 2 million, what will be the population in 10 years?**

14. **Find the present value of $5,000 due in 8 years, assuming an annual discount rate of 6%, compounded quarterly.**

15. **How long will it take for an investment to double if it grows at an annual interest rate of 7%, compounded annually?**

Arithmetic Sequences and Series

1. **Find the 10th term of the arithmetic sequence:** $2, 5, 8, 11,$
   ldots

   A. 25

   B. 29

   C. 30

   D. 32

2. **Given the arithmetic sequence where $a_1 = 4$ and the common difference $d = 3$, what is the 15th term?**

3. **If the 7th term of an arithmetic sequence is 20, and the common difference is 2, what is the first term?**

   A. 6

   B. 8

   C. 10

   D. 12

4. **Determine the sum of the first 20 terms of the arithmetic sequence:** $3, 6, 9, 12,$
   ldots

5. **An arithmetic sequence has the first term $a_1 = -5$ and common difference $d = 4$. Find the 12th term.**

6. **If the sum of the first 50 terms of an arithmetic sequence is 3,775, and the first term is 10, find the common difference.**

   A. 1.5

   B. 2

C. 2.5

D. 3

7. **Find the 20th term of the arithmetic sequence with the first term $a_1 = 7$ and the 5th term $a_5 = 31$.**

8. **The arithmetic series sum of the first n terms is given by $S_n = 40n + 3n^2$. What is the common difference d?**

9. **For the arithmetic sequence defined by $a_n = 5 + (n-1)7$, what is a_{15}?**

   A. 98

   B. 105

   C. 112

   D. 119

10. **Consider the arithmetic sequence where $a_1 = 12$ and the common difference $d = -3$. Calculate the sum of the first 15 terms.**

11. **If the 9th term of an arithmetic sequence is 35 and the 16th term is 70, what is the common difference?**

12. **In an arithmetic sequence, the sum of the first 30 terms is 930 and the common difference is 3. What is the first term?**

13. **Find the sum of all the odd integers from 1 to 99 inclusive.**

A. 2,500

B. 2,400

C. 2,600

D. 2,450

14. **If the sum of the first n terms of an arithmetic sequence is $S_n = \frac{n}{2}(a_1 + a_n)$, and $a_1 = 10$, $S_n = 880$, and $n = 16$, find a_n.**

15. **The 5th term of an arithmetic sequence is 20, and the 12th term is 62. Find the 8th term.**

A. 25

B. 28

C. 34

D. 37

Geometric Sequences and Series

1. **What is the 5th term of the geometric sequence where the first term is 2 and the common ratio is 3?**

   A. 18

B. 54
C. 162
D. 486

2. Calculate the sum of the first **6** terms of the geometric series where the first term is 5 and the common ratio is 2.

3. The third term of a geometric sequence is 24 and the sixth term is 192. What is the common ratio?

   A. 2
   B. 3
   C. 4
   D. 8

4. In a geometric sequence, the first term is 9 and the common ratio is $\frac{1}{3}$. Find the sum of the first 4 terms.

   A. 13
   B. 15
   C. 17
   D. 19

5. A geometric series has a sum of 63, with a first term of 3 and a common ratio of 2. How many terms are in the series?

6. Determine the **7th** term of the geometric sequence where the first term is 10 and the common ratio is 0.5.

7. What is the sum of the infinite geometric series with a first term of 8 and a common ratio of 0.25?

   A. 8.5
   B. 9
   C. 10
   D. 12

8. The sum of the first three terms of a geometric sequence is 13, and the common ratio is r. If the first term is a, express a in terms of r.

9. What is the **10th** term of the geometric sequence defined by the explicit formula $a_n = 5 \times 3^{n-1}$?

   A. $14,348$
   B. $19,683$
   C. $29,524$
   D. $59,049$

10. If the first term of a geometric sequence is 6 and the 4th term is 48, what is the common ratio?

11. Determine the sum of the geometric series:

$$7 + 14 + 28 + 56 + ext... + 1792$$

12. A geometric sequence begins with the terms $64, 32, 16, ext...$. What is the eighth term of the sequence?

A. 1.25
B. 2
C. 0.5

D. 0.25

13. **Find the sum of the first 10 terms of a geometric series where the first term is 3 and the common ratio is 2.**

14. **The 3rd term of a geometric sequence is 72, and the 6th term is 486. What is the first term?**

15. **Consider a geometric sequence with a first term of 1 and a common ratio of r. If the sum of the first three terms is $**

rac{13}{3}$, find the value of r.

Sigma Notation

1. **Evaluate the sum:**
$$\sum_{i=1}^{5} i^2$$

A. 15

B. 30

C. 55

D. 225

2. **Calculate the sum:**
$$\sum_{k=3}^{7} (2k+1)$$

A. 35

B. 45

C. 55

D. 65

3. **Find the sum of the series:**
$$\sum_{n=0}^{4} 3^n$$

A. 30

B. 40

C. 50

D. 60

4. **Evaluate:**
$$\sum_{m=2}^{6} (m^2 - m)$$

A. 40

B. 45

C. 50

D. 55

5. **Determine the sum:**

$$\sum_{p=1}^{4} \frac{1}{p}$$

A. $\frac{25}{12}$

B. $\frac{15}{12}$

C. $\frac{13}{12}$

D. $\frac{23}{12}$

6. **If**

$$\sum_{x=1}^{n} 5x = 75$$

, find the value of n**.**

A. 5

B. 6

C. 7

D. 8

7. **Compute:**

$$\sum_{j=1}^{4} (j^2 + 2j)$$

A. 44

B. 50

C. 54

D. 60

8. **Find the sum of:**

$$\sum_{t=1}^{3} \frac{2}{3^t}$$

A. $\frac{13}{9}$

B. $\frac{14}{9}$

C. $\frac{17}{9}$

D. $\frac{19}{9}$

9. **Evaluate the sum:**

$$\sum_{b=2}^{5} (4b - 1)$$

A. 33

B. 35

C. 37

D. 39

10. **Determine**

$$\sum_{a=0}^{3} 2^a$$

A. 5

B. 7

C. 9

D. 15

Binomial Expansion

1. **Find the binomial expansion of**

$$(x + y)^3$$

.

a) $x^3 + 3x^2y + 3xy^2 + y^3$

b) $x^3 - 3x^2y + 3xy^2 - y^3$

c) $x^3 + x^2y + xy^2 + y^3$

d) $x^3 - x^2y + xy^2 - y^3$

2. **What is the term that contains a^2b^3 in the expansion of**

$$(a + b)^5$$

?

a) $10a^2b^3$

b) $5a^2b^3$

c) $20ab^4$

d) $15a^3b^2$

3. **Calculate the coefficient of x^4 in the expansion of**

$$(2x - 3)^6$$

.

a) 180

b) 540

c) 1080

d) 3240

4. **Identify the middle term in the expansion of**

$$(x-2)^4$$

.

   a) $-16x^2$

   b) $32x^2$

   c) $24x^2$

   d) $-8x^2$

5. **What is the expanded form of**

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

?

   a) $27x^3 + 54x^2 + 36x + 8$

   b) $27x^3 + 54x^2 + 18x + 8$

   c) $27x^3 + 18x^2 + 36x + 8$

   d) $27x^3 + 36x^2 + 54x + 8$

6. **Find the coefficient of x^3y^2 in the expansion of**

$$(x+y)^5$$

.

   a) 5

   b) 10

   c) 20

   d) 30

7. **Determine the number of terms in the expansion of**

$$(a-b)^7$$

.

   a) 7

   b) 8

   c) 9

   d) 10

8. **Evaluate the expansion**

$$(x-1)^5$$

  . **What is the coefficient of the term x^3?**
   a) 5

   b) -10

   c) -30

d) 10

9. **What is the first term in the expansion of**

$$(2x + 3)^4$$

?

   a) $16x^4$

   b) $8x^3$

   c) $24x^3$

   d) 81

10. **Find the coefficient of x^2 in the expansion of**

$$(x + 2)^5$$

.

   a) 10

   b) 20

   c) 40

   d) 60

11. **Which expression represents the expansion of**

$$(x + 4)^3$$

?

   a) $x^3 + 12x^2 + 48x + 64$

   b) $x^3 + 8x^2 + 24x + 32$

   c) $x^3 + 6x^2 + 12x + 8$

   d) $x^3 + 10x^2 + 40x + 64$

12. **Identify the constant term in the expansion of**

$$(x + 2)(x - 2)^4$$

.

   a) -16

   b) 0

   c) 32

   d) -32

Matrix Operations

1. **Evaluate the sum of the matrices:**

$$\begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ 0 & 7 \end{bmatrix}$$

A. $\begin{bmatrix} 6 & 4 \\ 5 & 8 \end{bmatrix}$

B. $\begin{bmatrix} 6 & 3 \\ 5 & 8 \end{bmatrix}$

C. $\begin{bmatrix} 6 & 4 \\ 5 & 6 \end{bmatrix}$

D. $\begin{bmatrix} 6 & 4 \\ 0 & 8 \end{bmatrix}$

2. **Subtract the following matrices:**

$$\begin{bmatrix} 6 & 5 \\ 2 & 4 \end{bmatrix} - \begin{bmatrix} 3 & 1 \\ 0 & 6 \end{bmatrix}$$

A. $\begin{bmatrix} 3 & 4 \\ 2 & -2 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 4 \\ 2 & 10 \end{bmatrix}$

C. $\begin{bmatrix} 3 & 6 \\ 2 & -2 \end{bmatrix}$

D. $\begin{bmatrix} 9 & 6 \\ 2 & -2 \end{bmatrix}$

3. **What is the product of the given matrices?**

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

4. **If matrix $A = \begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$ and matrix $B = \begin{bmatrix} 4 & 2 \\ 5 & 1 \end{bmatrix}$, find $2A - B$.**

5. **Determine the scalar multiplication of 3 with the matrix:**

$$\begin{bmatrix} 2 & -2 \\ 1 & 4 \end{bmatrix}$$

A. $\begin{bmatrix} 6 & -6 \\ 3 & 12 \end{bmatrix}$

B. $\begin{bmatrix} 6 & -6 \\ 2 & 12 \end{bmatrix}$

C. $\begin{bmatrix} 5 & -6 \\ 3 & 12 \end{bmatrix}$

D. $\begin{bmatrix} 6 & -4 \\ 3 & 12 \end{bmatrix}$

6. **Express the matrix equation $AX = B$ in terms of X, given:**

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, \quad B = \begin{bmatrix} 5 \\ 11 \end{bmatrix}$$

7. **Find the result of the matrix multiplication:**

$$\begin{bmatrix} 0 & 2 & 1 \\ 1 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 2 & 1 \\ 0 & 3 \end{bmatrix}$$

8. **Calculate the determinant of the matrix:**

$$\begin{bmatrix} 3 & 8 \\ 4 & 6 \end{bmatrix}$$

9. **If a matrix C is added to $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and the result is $\begin{bmatrix} 4 & 3 \\ 1 & 5 \end{bmatrix}$, find matrix C.**

10. **Given two matrices $M = \begin{bmatrix} 1 & 2 \\ 3 & 1 \end{bmatrix}$ and $N = \begin{bmatrix} 2 & 0 \\ 1 & 2 \end{bmatrix}$, compute $2M + 3N$.**

Matrix Inverses and Determinants

1. **Given the matrix $A = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$, find the determinant of A.**

   A. 1
   B. 5
   C. 7
   D. 11

2. **What is the determinant of the matrix $B = \begin{pmatrix} 0 & 1 \\ 2 & 3 \end{pmatrix}$?**

   A. 3
   B. -2
   C. 1
   D. -1

3. **If the determinant of a 3×3 matrix C is 0, what can you say about the matrix C?**

4. **Find the inverse of the matrix $D = \begin{pmatrix} 4 & 7 \\ 2 & 6 \end{pmatrix}$.**

5. **If $\det(E) = -3$ for the matrix $E = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$, determine the value of $\det(2E)$.**

   A. -12
   B. -6
   C. 6
   D. 12

6. **Calculate the determinant of matrix $F = \begin{pmatrix} 3 & -1 & 2 \\ 0 & 5 & 1 \\ 4 & 2 & 3 \end{pmatrix}$.**

7. **Which of the following matrices is singular?**

   A. $G = \begin{pmatrix} 2 & 3 & 1 \\ 1 & 1 & 3 \\ 0 & 0 & 0 \end{pmatrix}$

   B. $H = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

   C. $I = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{pmatrix}$

   D. $J = \begin{pmatrix} 5 & 0 \\ 0 & 4 \end{pmatrix}$

8. **Determine the determinant of the matrix** $K = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{pmatrix}$.

9. **True or False: A matrix with a determinant of zero is invertible.**

   A. True
   B. False

10. **Given the non-singular matrix** $L = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$, **find** L^{-1}.

11. **What is the result when the determinant of a matrix is multiplied by a non-zero scalar** k**?**

A. The determinant remains unchanged.
B. The determinant is multiplied by k.
C. The determinant is raised to the power of k.
D. The determinant is divided by k.

12. **For which matrix** M **is the determinant equal to zero?**

A. $M = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

B. $M = \begin{pmatrix} 1 & 1 \\ 2 & 2 \end{pmatrix}$

C. $M = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

D. $M = \begin{pmatrix} 5 & 2 \\ 3 & 6 \end{pmatrix}$

13. **Determine the inverse of the matrix** $N = \begin{pmatrix} -2 & 1 \\ 1 & -1 \end{pmatrix}$.

14. **Find the determinant of the matrix** $P = \begin{pmatrix} 7 & 4 & 2 \\ 1 & 6 & 3 \\ 2 & 5 & 8 \end{pmatrix}$.

15. **Given matrix** Q**, where** $\det(Q) = 10$**, what is the determinant of the matrix** $3Q$**?**

A. 30
B. 90
C. 270
D. 300

Cramer's Rule Systems

1. **Solve the following system using Cramer's Rule:**

$$x + 2y = 5$$
$$3x - 4y = -2$$

   A) $x = 2, y = 1$
   B) $x = -1, y = 3$
   C) $x = 1, y = 2$
   D) $x = 0, y = 1$

2. **Apply Cramer's Rule to find** x **in the system:**

$$2x + 3y = 7$$
$$4x - y = 1$$

A) $x = 2$
B) $x = 1$
C) $x = 0$
D) $x = -1$

3. **Which of the following is the value of y using Cramer's Rule?**

$$5x + y = 9$$
$$2x + 4y = 8$$

A) $y = 0$
B) $y = 1$
C) $y = 2$
D) $y = 3$

4. **Determine x and y using Cramer's Rule:**

$$3x + 2y = 12$$
$$x - y = 2$$

A) $x = 4, y = 0$
B) $x = 2, y = -2$
C) $x = 3, y = 1$
D) $x = 5, y = 1$

5. **Use Cramer's Rule to solve for y:**

$$x + y = 4$$
$$2x + 5y = 10$$

A) $y = 2$
B) $y = 4$
C) $y = 1$
D) $y = 0$

6. **Find x using Cramer's Rule for this system:**

$$4x - y = 3$$
$$6x + y = 11$$

A) $x = 1$
B) $x = 2$
C) $x = 3$
D) $x = 4$

7. **Determine y for the system below using Cramer's Rule:**

$$7x + 3y = 10$$
$$2x - 5y = 4$$

A) $y = -1$
B) $y = 0$
C) $y = 1$
D) $y = 2$

8. **Calculate x and y using Cramer's Rule:**

$$5x - 2y = 15$$
$$3x + y = 7$$

A) $x = 3, y = 0$
B) $x = 2, y = 1$
C) $x = 1, y = 2$

D) $x = 0, y = 3$

9. **What is the value of x in the system below using Cramer's Rule?**

$$2x + y = 6$$
$$4x + 5y = 20$$

    A) $x = 0$
    B) $x = 1$
    C) $x = 2$
    D) $x = 3$

10. **Find the values of both x and y using Cramer's Rule:**

$$x + 3y = 7$$
$$2x - 4y = -2$$

    A) $x = 1, y = 2$
    B) $x = 2, y = 1$
    C) $x = 0, y = 3$
    D) $x = -1, y = 4$

Vector Basics

1. **Given vectors a $= \langle 2, 3 \rangle$ and b $= \langle -1, 4 \rangle$. Calculate a $+$ b.**
   A. $\langle 1, 7 \rangle$
   B. $\langle 1, -7 \rangle$
   C. $\langle 3, 7 \rangle$
   D. $\langle 3, -1 \rangle$

2. **What is the magnitude of the vector v $= \langle 6, 8 \rangle$?**
   A. 10
   B. $\sqrt{100}$
   C. 14
   D. 20

3. **If u $= \langle 4, -3 \rangle$, find 2u.**
   A. $\langle 8, -6 \rangle$
   B. $\langle 2, -1.5 \rangle$
   C. $\langle 4, 3 \rangle$
   D. $\langle 0, -3 \rangle$

4. **Calculate the dot product of a $= \langle 1, 2 \rangle$ and b $= \langle 3, 4 \rangle$.**
   A. 11
   B. 14
   C. 8
   D. 10

5. **For vectors p $= \langle -2, 5 \rangle$ and q $= \langle 4, 1 \rangle$, find p $-$ q.**
   A. $\langle -6, 4 \rangle$
   B. $\langle 6, 4 \rangle$
   C. $\langle -2, 6 \rangle$
   D. $\langle 2, 6 \rangle$

6. **Express the vector v $= \langle 0, -5 \rangle$ as a unit vector.**
   A. $\langle 0, -1 \rangle$
   B. $\langle 0, -5 \rangle$
   C. $\langle 0, 1 \rangle$
   D. $\langle 1, 0 \rangle$

7. **If u $= \langle 7, -24 \rangle$, what is the direction angle of u to the nearest degree?**
   A. $72°$

B. $-72°$
C. $108°$
D. $-108°$

8. **Does the vector c $= \langle 7, 7 \rangle$ make a $45°$ angle with the positive x-axis?**
   A. True
   B. False

9. **Determine the scalar projection of a onto b where a $= \langle 3, 4 \rangle$ and b $= \langle 1, 0 \rangle$.**
   A. 3
   B. 4
   C. 5
   D. -3

10. **For the vectors x $= \langle a, b \rangle$ and y $= \langle c, d \rangle$, find the conditions under which they are orthogonal.**
    A. $ac + bd = 1$
    B. $ac + bd = 0$
    C. $a + b = c + d$
    D. $a = c$ and $b = d$

Dot Product and Magnitude

1. **Calculate the dot product of vectors a $= \langle 2, 3 \rangle$ and b $= \langle 4, 5 \rangle$.**

   A. 23
   B. 14
   C. 26
   D. 31

2. **What is the magnitude of the vector v $= \langle 7, 24 \rangle$?**

   A. 25
   B. 31
   C. 24
   D. 30

3. **If a $= \langle -3, 4 \rangle$ and b $= \langle 6, 8 \rangle$, find a · b.**

4. **Determine the angle between vectors u $= \langle 1, 2 \rangle$ and v $= \langle 2, -1 \rangle$ using the dot product.**

   A. $90°$
   B. $45°$
   C. $60°$
   D. $120°$

5. **Find the magnitude of vector w $= \langle -5, 12 \rangle$.**

6. **Two vectors a and b are orthogonal if their dot product is zero. If a $= \langle 1, x \rangle$ and b $= \langle x, -1 \rangle$, find x.**

   A. 1
   B. -1
   C. 0
   D. 2

7. **Calculate the magnitude of the vector a $= \langle 3, -4 \rangle$.**

8. **a $= \langle 2, -3 \rangle$ and b $= \langle -2, 3 \rangle$; are these vectors orthogonal?**

   A. Yes
   B. No

9. Find the dot product of $\mathbf{u} = \langle 5, 0 \rangle$ and $\mathbf{v} = \langle 0, -5 \rangle$.

10. If the dot product of $\mathbf{a} = \langle a, 2 \rangle$ and $\mathbf{b} = \langle 3, 4 \rangle$ is **18**, what is the value of a?

A. 1
B. 2
C. 3
D. 5

11. What is the magnitude of the resultant vector of $\mathbf{p} = \langle 1, 2 \rangle$ and $\mathbf{q} = \langle 2, 3 \rangle$?

12. For vectors $\mathbf{a} = \langle 4, 0 \rangle$ and $\mathbf{b} = \langle 0, 6 \rangle$, what is the dot product?

A. 0
B. 24
C. 12
D. 6

13. Determine the magnitude of vector $\mathbf{b} = \langle 8, 6 \rangle$.

14. Calculate the dot product of $\mathbf{x} = \langle 1, 1 \rangle$ and $\mathbf{y} = \langle 3, -3 \rangle$.

15. If vectors $\mathbf{a} = \langle 0, 1 \rangle$ and $\mathbf{b} = \langle b_1, b_2 \rangle$ have a dot product of **4**, what is b_2?

Permutations and Combinations

1. **How many different ways can 5 books be arranged on a shelf?**

   A. 20
   B. 60
   C. 120
   D. 200

2. **In how many distinct ways can the letters of the word "STUDY" be arranged?**

   A. 60
   B. 120
   C. 240
   D. 360

3. **A committee of 4 people is to be chosen from a group of 10 people. How many different committees can be formed?**

   A. 210
   B. 320
   C. 504
   D. 720

4. **In how many ways can 3 students be selected from a class of 30 students?**

   A. 4060
   B. 5456
   C. 5984
   D. 6420

5. **A password consists of 3 letters followed by 3 digits. How many different passwords can be created if letters and digits can be repeated?**

   A. $26^3 \times 10^3$
   B. $26^3 \times 10^2$
   C. $26^2 \times 10^3$
   D. $26^2 \times 10^2$

6. **If you roll two six-sided dice, what is the probability of rolling a sum of 7?**

    A. $\frac{1}{6}$
    B. $\frac{1}{3}$
    C. $\frac{1}{12}$
    D. $\frac{1}{36}$

7. **How many ways can a president, a vice president, and a treasurer be chosen from a club with 12 members?**

    A. 1320
    B. 1728
    C. 2200
    D. 2800

8. **If a drawer contains 6 different colored socks, how many ways can you choose 2 socks from the drawer?**

    A. 12
    B. 15
    C. 21
    D. 30

9. **In a lottery, you choose 6 numbers out of 49. How many different combinations of numbers can you select?**

10. **There are 8 participants in a race. How many possible ways can the participants finish in first, second, and third places?**

A. 204
B. 320
C. 336
D. 420

11. **A pizza shop offers a choice of 3 different crusts, 4 types of cheese, and 6 different toppings. How many unique pizzas can you create by choosing one of each?**

12. **How many different 4-letter "words" can be formed using the letters A, B, C, D, and E if no letter repeats?**

A. 120
B. 60
C. 48
D. 40

13. **How many ways can you form a committee of 3 from a group of 8 people, if one specific person must be on the committee?**

A. 7
B. 15
C. 21
D. 35

14. **In how many unique ways can a person score exactly 15 points using 2-point and 3-point baskets only?**

A. 5
B. 6
C. 10
D. 12

Binomial Probabilities

1. **A coin is flipped 10 times. What is the probability of getting exactly 6 heads?**

   A. 0.205
   B. 0.246
   C. 0.355
   D. 0.375

2. **In a binomial distribution, if the probability of success is 0.4 and the number of trials is 5, what is the probability of exactly 2 successes?**

3. **An exam consists of 8 multiple-choice questions, each with 4 possible answers. If a student randomly guesses on each question, what is the probability of answering exactly 5 questions correctly?**

   A. 0.051
   B. 0.073
   C. 0.109
   D. 0.143

4. **Suppose a dice is rolled 12 times. What is the probability of rolling a six exactly twice?**

5. **A basketball player makes a shot with a probability of 0.65. If she takes 10 shots, what is the probability that she makes exactly 7 shots?**

   A. 0.215
   B. 0.266
   C. 0.366
   D. 0.445

6. **Calculate the probability that in 15 independent trials with a success probability of 0.3, there will be exactly 4 successes.**

7. **A manufacturing process has a defect rate of 2%. If 200 items are produced, what is the probability that exactly 3 items are defective?**

   A. 0.180
   B. 0.230
   C. 0.258
   D. 0.287

8. **In a game, the probability of winning is 0.25. What is the probability of losing 8 times in a row?**

   A. 0.100
   B. 0.104
   C. 0.142
   D. 0.171

9. **If a random variable X follows a binomial distribution with parameters $n = 10$ and $p = 0.5$, find the probability that X is at least 7.**

10. **What is the probability of drawing exactly 3 aces from a standard deck of 52 cards in 5 draws without replacement?**

A. 0.0027
B. 0.0075
C. 0.0129
D. 0.0154

11. **A survey shows that 70% of people prefer coffee over tea. If 10 people are surveyed, what is the probability that exactly 7 of them prefer coffee?**

12. **A biased coin lands heads with probability** 0.7**. If it is flipped 6 times, what is the probability of getting heads at least 4 times?**

A. 0.580
B. 0.644
C. 0.726
D. 0.795

13. **If 5% of a certain population carries a particular gene, what is the probability that in a sample of 20 people, at least one person has the gene?**

14. **An urn contains 6 red balls and 4 green balls. If 3 balls are drawn with replacement, what is the probability that exactly 2 of them are red?**

15. **A fair die is rolled 9 times. Determine the probability of getting exactly 5 fours.**

Statistics Measures

1. **Which measure of central tendency is most affected by extremely high or low values?**

   A. Mean
   B. Median
   C. Mode
   D. Range

2. **A set of data has the following values: 4, 8, 6, 5, 9. What is the mean of this data set?**

   A. 6.4
   B. 6.5
   C. 6.6
   D. 7.0

3. **Consider the numbers: 2, 3, 3, 7, 10. Find the median.**

   A. 3
   B. 4.5
   C. 5
   D. 6

4. **For the data set 15, 20, 20, 20, 22, what is the mode?**

   A. 15
   B. 20
   C. 22
   D. No mode

5. **In a given data set, the mean is 75, and the median is 80. Which of the following is likely true?**

   A. The data is symmetrically distributed.
   B. The distribution is skewed left.
   C. The distribution is skewed right.
   D. There are outliers on both ends.

6. **Calculate the range for the following set of numbers: 11, 13, 15, 17, 19.**

7. **Which statistic is a measure of variability?**

   A. Median

B. Mode

C. Standard Deviation

D. Mean

8. **Find the interquartile range (IQR) of the data set: 3, 7, 8, 12, 14, 15, 18.**

9. **A data set consists of the values: 5, 5, 7, 9, 11. If an additional value of 5 is added, how is the mean affected?**

   A. It increases.

   B. It remains the same.

   C. It decreases.

   D. It doubles.

10. **The weights (in kg) of a group of people are as follows: 45, 50, 55, 60, 65, 100. Which value is an outlier?**

11. **Given a symmetric distribution, which measure of central tendency represents the data most accurately?**

A. Mean

B. Median

C. Mode

D. Range

12. **For the data set: 4, 5, 8, 12, 13, 14, calculate the variance using the formula for variance.**

13. **What is the median of the following data set: 31, 34, 35, 36, 42, 45, 46, 47, 50, 52?**

14. **Which of the following is a characteristic of the normal distribution?**

A. Asymmetrical

B. Bell-shaped curve

C. Completely random

D. U-shaped curve

15. **Determine the mode(s) of the following data set: 5, 7, 9, 9, 10, 10, 10, 12.**

Normal Distributions

1. **If a dataset is normally distributed with a mean of 50 and a standard deviation of 5, what is the probability that a randomly selected value is less than 45?**

2. **In a normal distribution, approximately what percentage of the data falls within one standard deviation of the mean?**

   A. 68%

   B. 95%

   C. 99.7%

   D. 50%

3. **A test score is normally distributed with a mean of 80 and a standard deviation of 10. If a student scores 85, what is their z-score?**

   A. 0.5

   B. 1

   C. -0.5

   D. -1

4. **In a normal distribution, what is the probability of randomly selecting a value within 2 standard deviations from the mean?**

A. 50%
B. 68%
C. 95%
D. 99.7%

5. **The heights of a certain population are normally distributed with a mean of 170 cm and a standard deviation of 10 cm. What percentage of this population is taller than 180 cm?**

6. **If a normally distributed variable has a mean of 60 and a standard deviation of 5, what value represents the 97.5th percentile?**

7. **In a standard normal distribution, what is the probability of randomly selecting a value less than -1.96?**

A. 0.025
B. 0.05
C. 0.975
D. 0.995

8. **The scores of a math exam are normally distributed with a mean of 75 and a standard deviation of 8. What is the probability that a score is between 67 and 83?**

9. **If the average time to run a mile for a group of athletes is normally distributed with a mean of 7 minutes and a standard deviation of 0.5 minutes, what is the probability that an athlete runs a mile in less than 6.5 minutes?**

10. **To qualify for a certain college, applicants must score within the top 10% on a standardized test. If the test scores are normally distributed with a mean of 500 and a standard deviation of 100, what is the minimum score required to qualify?**

11. **The weight of apples from a certain orchard is normally distributed. If the mean weight is 150 grams with a standard deviation of 15 grams, what proportion of apples weigh more than 180 grams?**

12. **Which of the following scenarios likely results in a normal distribution?**

A. The number of heads in 100 coin flips
B. The heights of adult men in a large city
C. The roll of a fair six-sided die
D. The daily high temperatures in a desert region over a year

13. **A company finds out the time taken by workers to assemble a product is normally distributed with a mean of 30 minutes and a standard deviation of 4 minutes. If a worker is selected at random, what is the probability they will take more than 34 minutes to complete the assembly?**

14. **The IQ scores of adults in a certain region are normally distributed with a mean of 100 and a standard deviation of 15. What percentage of adults have an IQ score between 85 and 115?**

15. **In a normally distributed data set, what is the kurtosis of the distribution?**

A. 0
B. 1
C. 2
D. 3

Standard Deviation

1. **Given the data set: 3, 7, 8, 5, 12, 14, 21, 13, 18. Calculate the standard deviation.**

A. 5.32
B. 6.02
C. 5.16
D. 5.85

2. **For the data set 4, 9, 11, 12, 17, 5, 8, calculate the variance.**

   A. 14.29
   B. 15.69
   C. 13.79
   D. 16.49

3. **Which data set has a greater standard deviation: A) 2, 2, 2, 2, 2 or B) 1, 3, 5, 7, 9?**

   A. Data set A
   B. Data set B
   C. Both have the same standard deviation
   D. Cannot be determined

4. **Find the standard deviation of the following population data: 6, 9, 12, 15.**

5. **If the standard deviation of a data set is 8, what is the variance?**

   A. 16
   B. 32
   C. 64
   D. 128

6. **The average exam score of a class is 70 with a standard deviation of 5. What is the probability that a randomly selected student scored above 75, assuming a normal distribution?**

7. **Calculate the standard deviation of the data set: 10, 12, 23, 23, 16, 23, 21, 16.**

8. **For a data set with a mean of 50 and a standard deviation of 5, approximately 68% of the data falls within what range?**

   A. 40 to 60
   B. 45 to 55
   C. 50 to 60
   D. 45 to 65

9. **Two sets of data have the same mean, but one has a larger standard deviation. What does this indicate about the data sets?**

   A. The data with the larger standard deviation has values that are more spread out.
   B. The data with the larger standard deviation is more consistent.
   C. The data with the larger standard deviation has more data points.
   D. The data with the larger standard deviation is less consistent with its mean.

10. **Find the standard deviation of the sample data: 20, 21, 22, 24, 25.**

11. **For the data distribution, if the variance is 49, what is the standard deviation?**

A. 5
B. 6
C. 7
D. 8

12. **A dataset has a standard deviation of zero. What can be concluded about the data values?**

A. All values are different.
B. All values are the same.

C. Most values are zero.

D. No conclusion can be drawn.

Trigonometric Functions

1. **Evaluate:**
$$\sin\left(\frac{\pi}{3}\right)$$

   A. $\frac{1}{2}$

   B. $\frac{\sqrt{3}}{2}$

   C. 1
   D. $\sqrt{3}$

2. **What is the value of:**
$$\cos\left(\frac{\pi}{4}\right)$$

   A. $\frac{1}{2}$
   B. $\frac{\sqrt{2}}{2}$
   C. $\frac{\sqrt{3}}{2}$
   D. 1

3. **Solve for x given:**
$$\tan(x) = \sqrt{3},\ 0 \leq x < 2\pi$$

   A. $x = \frac{\pi}{3}$
   B. $x = \frac{2\pi}{3}$
   C. $x = \frac{\pi}{6}$
   D. $x = \frac{5\pi}{3}$

4. **Determine x such that**
$$\cos(x) = -1,\ 0 \leq x < 2\pi$$

5. **Find the exact value of:**
$$\sin\left(\frac{5\pi}{6}\right)$$

   A. $-\frac{1}{2}$
   B. $\frac{1}{2}$
   C. $\frac{\sqrt{3}}{2}$
   D. $-\frac{\sqrt{3}}{2}$

6. **Evaluate** $\cot(\pi)$**:**

   A. 0
   B. 1
   C. Undefined
   D. -1

7. **Find the principal value of** $\arctan(-\sqrt{3})$.

8. **Evaluate the expression:**
$$\sin(2x) + \cos(2x)$$

   given that $\sin(x) = \frac{1}{2}$ and $0 < x < \frac{\pi}{2}$.

9. **If** $\sec(x) = 2$**, what is** $\sin(x)$ **if** $0 < x < \pi$**?**

10. **Determine x such that**

$$\csc(x) = 2, \ \frac{\pi}{2} < x < \pi$$

11. **Find x such that**

$$\cos(2x) = \sin(x), \ 0 \le x < 2\pi$$

12. **What is the period of the function $y = 3\sin(4x)$?**

13. **Calculate $\sin(\pi - x)$ in terms of $\sin(x)$.**

14. **If $\tan(x) = \frac{5}{12}$ in the third quadrant, find $\cos(x)$.**

15. **Determine the amplitude of the function $y = -5\cos(3x)$.**

Unit Circle

1. **What is the coordinate of the point on the unit circle corresponding to an angle of $\frac{\pi}{6}$ radians?**
   A. $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
   B. $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
   C. $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
   D. $\left(\frac{-1}{2}, -\frac{\sqrt{3}}{2}\right)$

2. **Find the sine of $315°$ using the unit circle.**
   A. $-\frac{\sqrt{2}}{2}$
   B. $\frac{\sqrt{2}}{2}$
   C. $-\frac{1}{2}$
   D. $\frac{1}{2}$

3. **Determine the cosine of $\frac{5\pi}{4}$ from the unit circle.**
   A. $\frac{\sqrt{2}}{2}$
   B. $-\frac{\sqrt{2}}{2}$
   C. -1
   D. 1

4. **What is the tangent of $225°$ as determined from the unit circle?**
   A. 1
   B. -1
   C. $\sqrt{3}$
   D. $-\sqrt{3}$

5. **If an angle is $\frac{\pi}{3}$, what is the y-coordinate of the point on the unit circle?**
   A. $\frac{1}{2}$
   B. $\frac{\sqrt{3}}{2}$
   C. 1
   D. $\frac{\sqrt{2}}{2}$

6. **Using the unit circle, find the sine of $\frac{\pi}{2}$.**
   A. 0
   B. 1
   C. -1
   D. $\frac{\sqrt{2}}{2}$

7. **Calculate the cosine of an angle of $\frac{3\pi}{2}$ using the unit circle.**
   A. 0
   B. 1
   C. -1
   D. $\frac{\sqrt{2}}{2}$

8. **What are the coordinates on the unit circle at** $270°$**?**
   A. $(1, 0)$
   B. $(0, -1)$
   C. $(-1, 0)$
   D. $(0, 1)$
9. **Find the value of** $\sin(0)$ **based on the unit circle.**
   A. 0
   B. 1
   C. $\frac{1}{2}$
   D. -1
10. **If** $\cos(x) = \frac{1}{2}$**, what is a possible angle** x **in radians?**
    A. $\frac{\pi}{3}$
    B. $\frac{2\pi}{3}$
    C. $\frac{5\pi}{3}$
    D. $\frac{\pi}{6}$
11. **Which of the following is the point on the unit circle corresponding to** $60°$**?**
    A. $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
    B. $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
    C. $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
    D. $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
12. **Evaluate** $\tan(\pi)$ **using the unit circle.**
    A. 0
    B. 1
    C. Undefined
    D. -1
13. **What is the cosine of** $90°$**?**
    A. 1
    B. 0
    C. -1
    D. $\frac{1}{2}$
14. **If** $\sin(x) = -\frac{\sqrt{3}}{2}$**, what is a potential value for** x**?**
    A. $\frac{5\pi}{3}$
    B. $\frac{7\pi}{6}$
    C. $\frac{11\pi}{6}$
    D. $\frac{4\pi}{3}$
15. **Find the tangent of** $180°$ **using the unit circle.**
    A. 0
    B. 1
    C. Undefined
    D. -1

Trig Identities

1. **Which of the following is an identity?**

   A. $\sin(x) = \cos(90° - x)$
   B. $\tan(x) = \sin(x) \cdot \cos(x)$
   C. $\sin^2(x) + \cos^2(x) = 1$
   D. $\sec(x) = \frac{1}{\sin(x)}$

2. **Simplify the expression** $\frac{\sin(x)}{1+\cos(x)} + \frac{1+\cos(x)}{\sin(x)}$**.**

3. **Verify the identity:** $1 - \sin^2(x) = \cos^2(x)$.

4. **Express** $\tan(x) + \cot(x)$ **in terms of** $\sin(x)$ **and** $\cos(x)$.

5. **Which of the following expressions is equivalent to** $\sin(x) \cdot \cos(x)$**?**

   A. $\frac{1}{2}\sin(2x)$
   B. $2\sin(2x)$
   C. $-\cos(2x)$
   D. $\tan(2x)$

6. **Solve the equation** $2\sin^2(x) - \sin(x) - 1 = 0$ **for** $0 \le x < 2\pi$.

7. **Simplify the expression** $\frac{1-\cos(2x)}{\sin(2x)}$.

8. **Find the value of** $\sin(75°)$ **using identities.**

9. **Determine the equivalent expression for** $\sin(2x)$ **in terms of** $\sin(x)$ **and** $\cos(x)$.

10. **Express** $\cos(2x)$ **using only** $\cos(x)$ **and not** $\sin(x)$.

11. **Prove the identity** $\tan(x) = \frac{\sin(x)}{\cos(x)}$.

12. **If** $\sin(x) = \frac{3}{5}$ **and** $0 < x < \frac{\pi}{2}$, **find** $\cos(x)$.

13. **Which identity is used to verify** $\tan^2(x) + 1 = \sec^2(x)$**?**

A. Pythagorean identity
B. Reciprocal identity
C. Quotient identity
D. Double-angle identity

14. **Simplify** $\sin(x) \times \sec(x)$.

15. **What is** $\cot(90° - x)$ **equivalent to?**

A. $\tan(x)$
B. $\cot(x)$
C. $\sec(x)$
D. $\csc(x)$

Law of Sines and Cosines

1. **Triangle ABC has sides** $a = 7$, $b = 9$, **and** $c = 12$. **Using the law of cosines, find the measure of angle** A.

   A. $41.4°$
   B. $52.3°$
   C. $60.5°$
   D. $68.9°$

2. **In triangle DEF, side** $e = 15$ **cm, side** $f = 20$ **cm, and angle** $D = 45°$. **Using the law of cosines, calculate the length of side** d.

3. **In triangle GHI, angle** $G = 35°$, **angle** $H = 75°$, **and side** $g = 10$. **Use the law of sines to find the length of side** h.

   A. 8.7
   B. 9.5
   C. 10.3
   D. 11.1

4. **Triangle JKL is an isosceles triangle with sides $j = k = 13$ and a base $l = 10$. Using the law of cosines, determine measure of angle J.**

    A. 28.9°
    B. 34.9°
    C. 41.1°
    D. 46.7°

5. **In triangle MNO, angles $M = 60°$, $N = 45°$, and side $m = 14$. Find the length of side n using the law of sines.**

6. **In triangle PQR, sides $p = 8$, $q = 10$, and $r = 12$. Use the law of cosines to find the measure of angle Q.**

    A. 48.6°
    B. 53.1°
    C. 62.7°
    D. 70.2°

7. **Determine the area of triangle STU, with sides $s = 5$, $t = 7$, and $u = 10$, using Heron's formula.**

8. **In triangle VWX, side $v = 7$, side $w = 8$, and angle $X = 120°$. Calculate the length of side x using the law of cosines.**

    A. 12.1
    B. 12.4
    C. 12.8
    D. 13.0

9. **In triangle YZ, angle $Y = 72°$, angle $Z = 86°$, and side $y = 10$. Find the length of side z using the law of sines.**

10. **Triangle ABC is a right triangle with angle $C = 90°$, side $a = 9$, and side $b = 12$. Verify the length of side c using the Pythagorean theorem.**

A. 14.1
B. 14.7
C. 15.0
D. 15.3

11. **For triangle DEF, $d = 11$, $e = 14$, and angle $F = 30°$. Use the law of sines to find angle D.**

A. 32.5°
B. 35.7°
C. 37.8°
D. 40.2°

12. **In triangle GHI, side $g = 16$, side $h = 22$, and angle $I = 110°$. Determine the length of side i using the law of cosines.**

A. 26.1
B. 26.8
C. 27.4
D. 28.0

Trig Equations

1. **Solve for θ in the interval $0 \leq \theta < 2\pi$: $\sin 2\theta = \cos \theta$.**

2. **Find all solutions for $\tan^2 x = 3 \tan x + 4$.**

3. **Determine the general solution for** $\cos^2 x = \frac{1}{2}$.

   A. $x = \frac{\pi}{4} + n\pi,\ n \in \mathbb{Z}$
   B. $x = \frac{\pi}{3} + 2n\pi,\ n \in \mathbb{Z}$
   C. $x = \frac{\pi}{6} + 2n\pi,\ n \in \mathbb{Z}$
   D. $x = \frac{\pi}{4} + 2n\pi,\ n \in \mathbb{Z}$

4. **Solve** $2\sin x - 1 = 0$ **for** x **in the interval** $[0, 2\pi)$.

5. **Find** x **if** $\sin x + \cos x = 1,\ 0 \leq x < 2\pi$.

6. **Solve the equation** $\sec x = -2$ **for** x **in the interval** $0 \leq x < 2\pi$.

7. **For what values of** x **is** $\sin 2x = \sqrt{3}\cos x,\ 0 \leq x < 2\pi$?

   A. $x = \frac{\pi}{6}, \frac{5\pi}{6}$
   B. $x = \frac{\pi}{3}, \frac{2\pi}{3}$
   C. $x = \frac{\pi}{4}, \frac{3\pi}{4}$
   D. $x = \frac{\pi}{2}, \pi$

8. **Solve for** θ: $\cot \theta = \sqrt{3}$ **in** $[0, 2\pi)$.

9. **Determine the period of the solutions for** $4\cos^2 x = 3$ **and describe it generally.**

10. **If** $3\sin^2 x + \sin x - 2 = 0$, **find the values of** x **in** $0 \leq x < 2\pi$.

11. **Solve the equation** $\cos 2x + \sin x = 0$ **for** x **in the interval** $[0, 2\pi)$.

12. **If** $\tan x \cdot \cot x = 1$, **what does this imply about** x?

A. $x = \frac{n\pi}{2}$, n is an odd integer
B. $x = n\pi$, n is an integer
C. $x = \frac{\pi}{4} + \frac{n\pi}{2}$, n is an integer
D. $x = \frac{\pi}{2} + n\pi$, n is an integer

13. **Find the general solution:** $\sin x = \cos x$.

14. **Solve for** x: $2\cos^2 x - 3\cos x + 1 = 0$ **for** x **in** $[0, 2\pi)$.

15. **In which interval does** $\sin(2x) = \cos x$ **have solutions?**

   A. $0 \leq x < \frac{\pi}{2}$
   B. $\frac{\pi}{2} \leq x < \pi$
   C. $\pi \leq x < \frac{3\pi}{2}$
   D. $\frac{3\pi}{2} \leq x < 2\pi$

Trig Graphing

1. **What is the amplitude of the function** $y = 3\sin(x)$?

   A. 1

   B. 3

   C. 0

   D. 2

2. **Which of the following equations represents a sine wave with a period of** π?

   A. $y = \sin(2x)$

B. $y = \sin\left(\frac{x}{2}\right)$

C. $y = \sin\left(\frac{x}{3}\right)$

D. $y = \sin(3x)$

3. **What is the phase shift of the function $y = \cos\left(x - \frac{\pi}{4}\right)$?**

A. $-\frac{\pi}{4}$ to the left

B. $\frac{\pi}{4}$ to the right

C. $\frac{\pi}{4}$ to the left

D. No phase shift

4. **The function $y = 2\cos(x)$ has been graphed. How would the graph of $y = 2\cos(x + \pi)$ differ from the original?**

A. Shifted π units to the left

B. Shifted π units to the right

C. Shifted 2π units to the right

D. Reflected over the x-axis

5. **Which function has a vertical stretch of factor 4 and is reflected over the x-axis?**

A. $y = 4\sin(x)$

B. $y = -4\sin(x)$

C. $y = -\frac{1}{4}\sin(x)$

D. $y = \frac{1}{4}\sin(x)$

6. **Determine the range of the function $y = -5\sin(x)$.**

7. **Identify the horizontal shift for the function $y = \sin\left(x + \frac{\pi}{3}\right)$.**

A. $\frac{\pi}{3}$ to the left

B. $\frac{\pi}{3}$ to the right

C. No shift

D. $\frac{2\pi}{3}$ to the left

8. **Find the period of the function $y = \cos(4x)$.**

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. π

9. **Given the function $y = \tan(x)$, what transformation produces $y = \tan\left(x - \frac{\pi}{6}\right)$?**

A. Horizontal shift $\frac{\pi}{6}$ to the right

B. Horizontal shift $\frac{\pi}{6}$ to the left

C. Vertical stretch

D. Reflect over the x-axis

10. **A sine function has been modified to $y = 3\sin(2x)$. What are the amplitude and period of this function?**

11. **If the function $y = \cos(x)$ is shifted up by 2 units, what is the new equation?**

12. **What is the period of the function $y = \sin\left(\frac{x}{2}\right)$?**

A. π

B. 2π

C. 4π

D. $\frac{\pi}{2}$

13. **Determine the equation of a sine function with amplitude 1 and period π.**

Trig Inverse Functions

1. **What is the exact value of $\sin^{-1}(-\frac{1}{2})$?**

   A. $\frac{\pi}{6}$
   B. $-\frac{\pi}{6}$
   C. $\frac{5\pi}{6}$
   D. $-\frac{5\pi}{6}$

2. **Find the exact value of $\cos^{-1}(0)$.**

   A. $\frac{\pi}{4}$
   B. $\frac{\pi}{2}$
   C. π
   D. $\frac{3\pi}{2}$

3. **Determine $\tan^{-1}(1)$.**

   A. $\frac{\pi}{4}$
   B. $\frac{\pi}{3}$
   C. $\frac{\pi}{6}$
   D. π

4. **What is the value of $\sin^{-1}(\sin(\frac{3\pi}{4}))$?**

   A. $\frac{\pi}{4}$
   B. $\frac{\pi}{3}$
   C. $\frac{3\pi}{4}$
   D. $\frac{\pi}{2}$

5. **Evaluate $\cos^{-1}(\cos(\frac{5\pi}{3}))$.**

   A. $\frac{\pi}{3}$
   B. $\frac{2\pi}{3}$

C. $\frac{5\pi}{3}$

D. $\frac{\pi}{6}$

6. **If $\theta = \tan^{-1}(\frac{1}{\sqrt{3}})$, find $\sin(\theta)$.**

   A. $\frac{1}{2}$

   B. $\frac{\sqrt{3}}{2}$

   C. $\frac{\sqrt{2}}{2}$

   D. $\frac{\sqrt{3}}{3}$

7. **What is $\sin(\cos^{-1}(\frac{2}{5}))$?**

   A. $\sqrt{\frac{21}{25}}$

   B. $\frac{3}{5}$

   C. $\frac{\sqrt{21}}{5}$

   D. $\frac{\sqrt{21}}{25}$

8. **Find $\tan(\sin^{-1}(\frac{3}{5}))$.**

   A. $\frac{4}{3}$

   B. $\frac{3}{4}$

   C. $\frac{\sqrt{16}}{5}$

   D. $\frac{\sqrt{16}}{3}$

9. **Solve for x: $\sin^{-1}(x) = \frac{\pi}{6}$.**

10. **Determine $\cos(\tan^{-1}(\frac{5}{12}))$.**

    A. $\frac{5}{13}$

    B. $\frac{12}{13}$

    C. $\frac{5}{12}$

    D. $\frac{12}{5}$

Complex Plane

1. **What is the result of multiplying $z_1 = 3 + 4i$ by $z_2 = 1 - 2i$?**

   A. $11 + 2i$

   B. $11 - 2i$

   C. $7 + 10i$

   D. $7 - 10i$

2. **If $z = 6i$, what is z^2?**

   A. -36

   B. 36

   C. $-6i$

   D. $36i$

3. **Which of the following represents the conjugate of $z = 5 - 3i$?**

   A. $-5 + 3i$

   B. $5 + 3i$

   C. $-5 - 3i$

   D. $5 - 3i$

4. **What is the magnitude of the complex number $z = 3 - 4i$?**

A. 3
B. 4
C. 5
D. 7

5. **Calculate the sum** $(2 + 3i) + (4 - i)$.

6. **Find the result of subtracting** $z_1 = 1 + 2i$ **from** $z_2 = 7 - 5i$.

    A. $8 - 7i$
    B. $6 - 7i$
    C. $8 - 3i$
    D. $6 - 3i$

7. **Which of the following is equivalent to** i^5?

    A. i
    B. $-i$
    C. 1
    D. -1

8. **If** $z_1 = 2 - i$ **and** $z_2 = -1 + 3i$, **find** $z_1 + z_2$.

    A. $1 + 2i$
    B. $1 + 4i$
    C. $3 + 2i$
    D. $-3 + 2i$

9. **What is the division of** $z = 4 + 6i$ **by** $2 + i$?

10. **Express the product** $(5i)(-3i)$ **as a real number.**

A. -15
B. 15
C. -9
D. 9

11. **Calculate the polar form of** $z = 1 + i$.

12. **If** $z = -2 + 2i$, **what is** $|z|^2$?

A. 4
B. 8
C. 16
D. -8

Polar Coordinates

1. **Convert the rectangular coordinates (3, 3) to polar coordinates.**

    A. $(3\sqrt{2}, \frac{\pi}{4})$
    B. $(3\sqrt{3}, \frac{\pi}{6})$
    C. $(6, \frac{\pi}{3})$
    D. $(3, \frac{\pi}{4})$

2. **If the polar coordinates are given by** $(r, \theta) = (5, \frac{\pi}{3})$, **what are the rectangular coordinates?**

    A. $\left(\frac{5\sqrt{3}}{2}, \frac{5}{2}\right)$
    B. $\left(\frac{5}{2}, \frac{5\sqrt{3}}{2}\right)$
    C. $(5, 0)$
    D. $(0, 5)$

3. **Which of the following is the correct polar form of the complex number $4 + 4i$?**

   A. $4\sqrt{2}(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4})$
   B. $4(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3})$
   C. $8(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6})$
   D. $8(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4})$

4. **Find the polar coordinates for the point with rectangular coordinates $(-2, 2)$.**

   A. $(2\sqrt{2}, \frac{3\pi}{4})$
   B. $(2\sqrt{3}, \frac{3\pi}{4})$
   C. $(2\sqrt{2}, \frac{\pi}{2})$
   D. $(2, \frac{3\pi}{4})$

5. **Express the polar equation $r = 4\cos\theta$ in rectangular form.**

6. **The point P in polar coordinates is given by $(7, \frac{\pi}{6})$. What is the distance from P to the origin?**

7. **Convert the polar coordinates $(10, \frac{\pi}{3})$ to rectangular coordinates.**

   A. $(5, 5\sqrt{3})$
   B. $(5\sqrt{3}, 5)$
   C. $(10, 10)$
   D. $(10\sqrt{3}, 10\sqrt{3})$

8. **Determine the polar coordinates for the point $(0, -4)$.**

   A. $(4, \frac{3\pi}{2})$
   B. $(4, \frac{\pi}{2})$
   C. $(4, \frac{\pi}{3})$
   D. $(4, 2\pi)$

9. **Which of the following is the correct rectangular form of the polar equation $r = 3\sin\theta$?**

   A. $x = 3$
   B. $y = 3$
   C. $x^2 + y^2 = 9$
   D. $y = 3x$

10. **A point in polar coordinates is given by $(r, \theta) = (8, \frac{\pi}{2})$. What are the rectangular coordinates?**

    A. $(8, 0)$
    B. $(0, 8)$
    C. $(0, -8)$
    D. $(8, 8)$

11. **Express the rectangular equation $x^2 + y^2 = 16$ in polar form.**

12. **Find the polar coordinates of the point with rectangular coordinates $(0, 5)$.**

    A. $(5, 0)$
    B. $(5, \frac{\pi}{2})$
    C. $(5, \pi)$
    D. $(5, \frac{3\pi}{2})$

13. **Convert the polar coordinates $(3, 0)$ to rectangular.**

14. **The polar coordinates (r, θ) satisfy $r = 2\sin\theta$. What is the equivalent rectangular equation?**

    A. $y = 2$
    B. $y = 2x$

C. $x^2 + y^2 = 4$
D. $y = 2$

15. **If a point has polar coordinates $(6, \pi)$, what are the corresponding rectangular coordinates?**

   A. $(6, 0)$
   B. $(-6, 0)$
   C. $(0, 6)$
   D. $(0, -6)$

Parametric Equations

1. **Given the parametric equations $x = 3t + 2$ and $y = 4t - 1$, what is the Cartesian equation of the curve?**

   A. $y = \frac{4}{3}x - \frac{11}{3}$
   B. $y = \frac{4}{3}x + \frac{1}{3}$
   C. $y = \frac{3}{4}x - \frac{11}{4}$
   D. $y = \frac{3}{4}x + \frac{1}{4}$

2. **The parametric equations of a line are $x = 2 + t$ and $y = 5 - 3t$. Find the slope of the line.**

   A. 3
   B. -3
   C. 1
   D. -1

3. **A curve is defined parametrically by $x = 5\cos(\theta)$ and $y = 5\sin(\theta)$. What is the equation of the corresponding circle?**

   A. $x^2 + y^2 = 5$
   B. $x^2 + y^2 = 25$
   C. $x^2 + y^2 = 10$
   D. $x^2 + y^2 = 50$

4. **For the parametric equations $x = 4 + t^2$ and $y = t - 3$, eliminate the parameter and find the Cartesian equation.**

   A. $y = \sqrt{x - 4} - 3$
   B. $y = \pm\sqrt{x - 4} - 3$
   C. $y = (x - 4)^2 - 3$
   D. $y = \sqrt{x - 4} + 3$

5. **Given the parametric equations $x = 2\sin(t)$ and $y = 3\cos(t)$, find the equation of the ellipse formed.**

   A. $\frac{x^2}{4} + \frac{y^2}{9} = 1$
   B. $\frac{x^2}{9} + \frac{y^2}{4} = 1$
   C. $\frac{x^2}{4} + \frac{y^2}{3} = 1$
   D. $\frac{x^2}{2} + \frac{y^2}{3} = 1$

6. **If a particle's motion is described by $x = 3e^t$ and $y = e^{2t}$, what is the relation between x and y?**

   A. $x^2 = y^3$
   B. $x^3 = y^2$
   C. $xy = 1$
   D. $x = y^2$

7. **The parametric equations $x = t^2 + 2$ and $y = 2t + 3$ define a curve. What is the range of y if t is any real number?**

   A. $(-\infty, \infty)$
   B. $[3, \infty)$
   C. $(-\infty, 3]$
   D. $[5, \infty)$

8. **Solve for t in terms of x given the parametric equation $x = \frac{5}{2}t + 1$.**

9. **Convert the following parametric equations to a single Cartesian equation:** $x = 8\cos(\theta)$, $y = 8\sin(\theta)$.

10. **If $x = \sqrt{t}$ and $y = t^2$, express y as a function of x.**

Vectors Dot Product

1. **What is the dot product of the vectors $a = \langle 2, 3, -1 \rangle$ and $b = \langle 4, -1, 5 \rangle$?**

   A. 5
   B. 8
   C. 11
   D. 18

2. **Find the dot product of $a = \langle 1, 0, -3 \rangle$ and $b = \langle -2, 4, 1 \rangle$.**

3. **If $a = \langle 3, 2 \rangle$ and $b = \langle 1, -5 \rangle$, what is $a \cdot b$?**

   A. 5
   B. -7
   C. -13
   D. 17

4. **Calculate the dot product of $a = \langle 0, 2, 4 \rangle$ and $b = \langle 7, 1, -3 \rangle$.**

5. **Given $a = \langle 5, 1 \rangle$ and $b = \langle -2, 4 \rangle$, find $a \cdot b$.**

   A. -6
   B. 3
   C. 18
   D. 20

6. **What is the dot product of $a = \langle 1, -7 \rangle$ and $b = \langle 0, 6 \rangle$?**

7. **If the vectors $a = \langle 9, 2, 5 \rangle$ and $b = \langle -3, 4, 2 \rangle$, what is $a \cdot b$?**

8. **Determine the dot product of $a = \langle -3, 1, 2 \rangle$ and $b = \langle 4, 0, -1 \rangle$.**

   A. -14
   B. -10
   C. -7
   D. 8

9. **Calculate the dot product for the vectors $a = \langle 0, 0, 1 \rangle$ and $b = \langle 1, 2, 3 \rangle$.**

10. **What is the result of $a \cdot b$ if $a = \langle -5, 4 \rangle$ and $b = \langle 2, 7 \rangle$?**

A. 18
B. 10
C. -10
D. -12

11. **Compute the dot product of $u = \langle 1, 2, 3 \rangle$ and $v = \langle 4, 5, 6 \rangle$.**

12. **Find the dot product of a $= \langle 2, -1, 3 \rangle$ and b $= \langle 0, 7, -1 \rangle$.**

A. -10
B. -13
C. 1
D. 4

13. **What is the dot product of two orthogonal vectors a and b?**

A. 0
B. 1
C. Depends on the vectors
D. Cannot be determined

14. **Calculate a $\cdot$ b for a $= \langle -6, 3 \rangle$ and b $= \langle 4, -2 \rangle$.**

15. **If a $= \langle 3, 3 \rangle$ and b $= \langle 1, -1 \rangle$, what is a $\cdot$ b?**

A. 0
B. 3
C. -6
D. 9

Analytic Geometry

1. Determine the distance between the points $(3, 4)$ and $(-1, 2)$.
   A) 4

   B) $2\sqrt{5}$

   C) 5

   D) $\sqrt{20}$

2. Find the midpoint of the line segment connecting the points $(5, -3)$ and $(-4, 6)$.
   A) $(0.5, 1.5)$

   B) $(\frac{1}{2}, \frac{3}{2})$

   C) $(\frac{1}{2}, \frac{-3}{2})$

   D) $(-1, 1.5)$

3. What is the equation of the circle with center $(2, -3)$ and radius 4?
   A) $(x - 2)^2 + (y + 3)^2 = 16$

   B) $(x + 2)^2 + (y - 3)^2 = 16$

   C) $(x - 2)^2 + (y - 3)^2 = 16$

   D) $(x + 2)^2 + (y + 3)^2 = 16$

4. Find the equation of a line with slope $\frac{3}{4}$ passing through the point $(0, 5)$.
   A) $y = \frac{3}{4}x + 5$

   B) $y = \frac{3}{4}x - 5$

   C) $y = -\frac{3}{4}x + 5$

D) $y = \frac{4}{3}x + 5$

5. Which of the following is the equation for a parabola with vertex at $(1, -2)$ and axis of symmetry parallel to the y-axis?

A) $(x - 1)^2 = 4(y + 2)$

B) $(y + 2)^2 = 4(x - 1)$

C) $(x + 1)^2 = -4(y - 2)$

D) $(y - 2)^2 = -4(x + 1)$

6. Determine the coordinates of the focus for the parabola given by the equation $(x - 1)^2 = 8(y + 3)$.

A) $(1, -1)$

B) $(1, -5)$

C) $(1, 1)$

D) $(1, -7)$

7. What is the equation of the ellipse with foci at $(0, \pm5)$ and vertices at $(0, \pm7)$?

A) $\frac{x^2}{49} + \frac{y^2}{24} = 1$

B) $\frac{x^2}{24} + \frac{y^2}{49} = 1$

C) $\frac{x^2}{16} + \frac{y^2}{25} = 1$

D) $\frac{x^2}{25} + \frac{y^2}{16} = 1$

8. Find the equation of the hyperbola with vertices at $(\pm3, 0)$ and foci at $(\pm5, 0)$.

A) $\frac{x^2}{9} - \frac{y^2}{16} = 1$

B) $\frac{x^2}{16} - \frac{y^2}{9} = 1$

C) $\frac{x^2}{25} - \frac{y^2}{16} = 1$

D) $\frac{x^2}{9} - \frac{y^2}{25} = 1$

9. Calculate the length of the major axis of the ellipse given by the equation $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

A) 3

B) 6

C) 5

D) 9

10. What is the eccentricity of the ellipse described by $\frac{x^2}{16} + \frac{y^2}{36} = 1$?

A) $\frac{1}{2}$

B) $\frac{4}{5}$

C) $\frac{5}{6}$

D) $\frac{2}{3}$

11. Determine the equation of the circle that passes through the origin and has a diameter with endpoints at $(2, 3)$ and $(6, 7)$.

A) $(x - 4)^2 + (y - 5)^2 = 10$

B) $(x - 4)^2 + (y - 5)^2 = 25$

C) $(x + 4)^2 + (y + 5)^2 = 20$

D) $(x - 4)^2 + (y - 5)^2 = 32$

12. For a hyperbola centered at the origin with the equation $\frac{x^2}{9} - \frac{y^2}{4} = 1$, determine the equation of the conjugate axis.

A) $x = 0$

B) $y = 0$

C) $y = \pm 3$

D) $x = \pm 2$

Linear Regression

1. **Given the following data points, find the linear regression equation:**

   (1, 2), (2, 3), (3, 5), (4, 7)
   Answer Choices:
   A. $y = 1.5x + 0.5$
   B. $y = 1.75x + 0.25$
   C. $y = 2x + 1$
   D. $y = 1.25x + 0.75$

2. **Determine the correlation coefficient for the data set:**

   Data: (1, 2), (2, 3), (3, 5), (4, 7)

3. **Which of the following represents the equation of the line of best fit for the following data points?**

   (0, 1), (1, 2.2), (2, 3.9), (3, 6.1)
   Answer Choices:
   A. $y = 2x + 1$
   B. $y = 1.9x + 0.9$
   C. $y = 2.1x + 0.8$
   D. $y = 1.8x + 1.2$

4. **If a linear model has a slope of 3 and a y-intercept of -2, what is the regression equation?**

   Answer Choices:
   A. $y = 3x - 2$
   B. $y = -2x + 3$
   C. $y = 2x - 3$

D. $y = 3x + 2$

5. **Based on the least squares regression line $y = 0.5x + 1.5$, predict the value of y when $x = 10$.**

6. **For the given data points, calculate the residual for the point $(2, 4)$ given the regression line $y = 1.5x + 1$.**

7. **What is the sum of the squared residuals for the following data and linear regression line?**

   Data: $(1, 3), (2, 5), (3, 7)$
   Regression Line: $y = 2x + 1$

8. **Identify the point that is an outlier from the given data set using the equation of the regression line:**

   Data: $(1, 2), (2, 3), (3, 8), (4, 5)$
   Regression Line: $y = x + 1$

9. **A dataset shows a perfect linear relationship with a negative slope. What is the correlation coefficient?**

   Answer Choices:
   A. 1
   B. 0.5
   C. 0
   D. -1

10. **Which of the following data sets would be best described by a linear regression model?**

    Data Sets:
    A. Data showing age vs. height in adults
    B. Data showing time vs. bacteria growth
    C. Data showing monthly temperature variations
    D. Data showing income vs. years of education

Data Modeling

1. **If a company's revenue model is represented by the equation $R = 200x - 1500$, where R is the revenue in dollars and x is the number of units sold, what is the revenue when 100 units are sold?**

   A. \$18,500
   B. \$19,500
   C. \$20,500
   D. \$21,500

2. **The profit P (in dollars) for selling x units of a product is given by $P = 50x - 400$. Determine the number of units that must be sold to achieve a profit of 2000.**

3. **A linear model for predicting sales, S, based on advertising expenditure, A, is given by $S = 3A + 250$. Calculate the sales if the advertising expenditure is \$400.**

   A. 1250
   B. 1450
   C. 1550
   D. 1750

4. **Consider the linear demand function $D = -5p + 350$, where D is the quantity demanded and p is the price of the product. What is the quantity demanded when the price is \$60?**

5. The cost C for producing x items is modeled by $C = 15x + 600$. What is the cost when **50 items are produced?**

   A. $750
   B. $1100
   C. $1350
   D. $1650

6. A train travels at a speed modeled by $S = 60t + 30$, where S is the speed in miles per hour and t is the time in hours. Find the speed of the train after **5 hours.**

7. In a certain city, the number of people attending a festival every year can be modeled by the quadratic equation $N = 5t^2 + 20t + 100$, where N is the number of attendees and t is the number of years after **2020**. Predict the number of attendees in **2025**.

8. A company's profit, in thousands of dollars, can be modeled by $P(x) = x^3 - 6x^2 + 11x - 6$. Find the profit when $x = 3$.

9. The relationship between the temperature T in degrees Celsius and time t in hours can be modeled by $T = -4t + 30$. What is the temperature after **6 hours?**

10. A quadratic model for a ball's height, h, after t seconds is given by $h = -16t^2 + 64t + 5$. Calculate the height after **2 seconds.**

11. The function $F(x) = 120 + 5x^2 - 2x^3$ models the number of units produced by a factory in month x. Determine the number of units produced in month 4.

12. A company's revenue can be modeled using the exponential function $R(t) = 500e^{0.05t}$, where t is the time in years. Compute the revenue after **3 years.**

13. The price of a product decreases exponentially according to the model $P(t) = P_0 e^{-0.1t}$ where P_0 is the initial price. If the initial price is **$100**, calculate the price after **2 years.**

14. Determine the break-even point for the profit model $P = 30x - 450$. At what number of units does the company break even?

A. 10
B. 15
C. 20
D. 25

15. A distribution function is given as $D(x) = \frac{5}{x+2}$ for $x > 0$. Evaluate this function when $x = 3$.

Probability Rules

1. What is the probability of rolling an even number on a six-sided die?
   A. $\frac{1}{6}$
   B. $\frac{1}{3}$
   C. $\frac{1}{2}$
   D. $\frac{2}{3}$
2. If two coins are flipped, what is the probability of getting at least one head?
   A. $\frac{1}{4}$
   B. $\frac{1}{3}$
   C. $\frac{1}{2}$
   D. $\frac{3}{4}$
3. In a standard deck of **52 cards**, what is the probability of drawing a heart?
   A. $\frac{1}{4}$
   B. $\frac{1}{3}$
   C. $\frac{1}{2}$

D. $\frac{1}{13}$

4. **What is the probability of drawing a queen from a standard deck of 52 cards?**
   A. $\frac{1}{13}$
   B. $\frac{1}{4}$
   C. $\frac{1}{52}$
   D. $\frac{1}{26}$

5. **A jar contains 4 red, 5 blue, and 6 green marbles. If a marble is drawn at random, what is the probability that it is blue?**
   A. $\frac{5}{15}$
   B. $\frac{1}{3}$
   C. $\frac{3}{5}$
   D. $\frac{2}{5}$

6. **If you roll two dice, what is the probability that the sum is 7?**
   A. $\frac{1}{12}$
   B. $\frac{1}{9}$
   C. $\frac{1}{6}$
   D. $\frac{1}{36}$

7. **There are 3 red, 2 yellow, and 5 green balls in a basket. What is the probability of not picking a yellow ball?**
   A. $\frac{1}{10}$
   B. $\frac{2}{10}$
   C. $\frac{4}{5}$
   D. $\frac{7}{10}$

8. **What is the probability of drawing an Ace and then a King from a standard deck without replacement?**
   A. $\frac{1}{169}$
   B. $\frac{1}{221}$
   C. $\frac{4}{663}$
   D. $\frac{1}{1326}$

9. **A box contains 3 defective and 7 non-defective items. If two items are drawn at random without replacement, what is the probability that both are defective?**
   A. $\frac{1}{30}$
   B. $\frac{1}{15}$
   C. $\frac{1}{12}$
   D. $\frac{1}{20}$

10. **What is the probability of drawing a face card from a standard deck of 52 cards?**
    A. $\frac{3}{13}$
    B. $\frac{1}{4}$
    C. $\frac{1}{13}$
    D. $\frac{1}{2}$

11. **If a six-sided die is rolled, what is the probability of getting a number less than 5?**
    A. $\frac{1}{6}$
    B. $\frac{2}{3}$
    C. $\frac{4}{6}$
    D. $\frac{5}{6}$

12. **What is the probability of drawing a king of hearts from a standard deck of 52 cards?**
    A. $\frac{1}{52}$
    B. $\frac{1}{13}$
    C. $\frac{1}{4}$
    D. $\frac{1}{26}$

13. **There are four apples, five oranges, and six bananas in a fruit basket. What is the**

probability of picking an orange?

A. $\frac{1}{3}$

B. $\frac{5}{15}$

C. $\frac{1}{5}$

D. $\frac{2}{5}$

14. **If two dice are rolled, what is the probability of rolling a double (i.e., two of the same number)?**

A. $\frac{1}{6}$

B. $\frac{1}{12}$

C. $\frac{1}{36}$

D. $\frac{1}{8}$

15. **A bag contains five red, four blue, and three green marbles. If one marble is drawn at random, what is the probability that it is green?**

A. $\frac{1}{4}$

B. $\frac{3}{12}$

C. $\frac{1}{5}$

D. $\frac{1}{3}$

Conditional Probability

1. **Given that a card drawn from a standard deck is a heart, what is the probability that it is also a face card?**

A. $\frac{3}{13}$

B. $\frac{1}{4}$

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

D. $\frac{1}{2}$

2. **A jar contains 3 red, 5 blue, and 2 green marbles. If one marble is drawn, what is the probability that it is red given that it is not green?**

A. $\frac{1}{3}$

B. $\frac{3}{7}$

C. $\frac{3}{10}$

D. $\frac{3}{8}$

3. **There are 4 aces in a deck of 52 cards. If a card is drawn and it is a spade, what is the probability that it is also an ace?**

A. $\frac{1}{13}$

B. $\frac{1}{4}$

C. $\frac{1}{52}$

D. $\frac{1}{26}$

4. **A bag contains 4 white balls and 6 black balls. A ball is drawn at random. If it is a white ball, what is the probability that there are exactly 5 balls left in the bag?**

A. $\frac{2}{5}$

B. 0

C. $\frac{9}{10}$

D. 1

5. **In a class of 30 students, 18 are female. If a student is chosen at random, what is the probability that the student is a male, given that the student selected is not a female?**
   A. $\frac{1}{2}$

   B. $\frac{1}{3}$

   C. 1

   D. $\frac{3}{5}$

6. **A die is rolled and a coin is tossed. What is the probability of rolling a 5 given that the coin shows heads?**
   A. $\frac{1}{2}$

   B. $\frac{1}{3}$

   C. $\frac{1}{6}$

   D. $\frac{1}{12}$

7. **In a survey of 100 people, 62 like tea, 30 like coffee, and 20 like both. If a person likes tea, what is the probability that they also like coffee?**
   A. $\frac{1}{5}$

   B. $\frac{1}{3}$

   C. $\frac{10}{31}$

   D. $\frac{5}{31}$

8. **A box contains 5 black and 3 white socks. If a sock drawn is white, what is the probability that another sock drawn from the box is black?**
   A. $\frac{5}{8}$

   B. $\frac{5}{7}$

   C. $\frac{4}{7}$

   D. $\frac{3}{7}$

9. **A student must choose one of the 5 questions on an exam. If the student chooses at random and each question has a 1/5 probability, what is the probability they choose the second one given they did not choose the first one?**
   A. $\frac{1}{4}$

   B. $\frac{1}{5}$

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

   D. $\frac{1}{2}$

10. **In a game, a spinner has 8 equal sections numbered 1 to 8. If it stops at an even number, what is the probability that it stops at number 4?**

A. $\frac{1}{4}$

B. $\frac{1}{5}$

C. $\frac{1}{2}$

D. $\frac{1}{8}$

Counting Principles

1. **How many different three-digit numbers can be formed using the digits 1, 2, 3, 4, and 5 if repetition is not allowed?**
   A. 60
   B. 80
   C. 100
   D. 120
2. **In how many ways can the letters in the word 'MATH' be arranged?**
   A. 12
   B. 16
   C. 24
   D. 36
3. **A password consists of 2 letters followed by 4 digits. How many possible passwords can be created if repetition is allowed?**
   A. $26^2 \times 10^4$
   B. $26 \times 25 \times 10^4$
   C. $26^2 \times 10^3$
   D. 26×10^4
4. **There are 8 runners in a race. In how many different ways can the runners finish first, second, and third?**
   A. 56
   B. 112
   C. 336
   D. 512
5. **If a club has 10 members, how many ways can the club choose a president, a vice president, and a treasurer if no person can hold more than one position?**
   A. 720
   B. 800
   C. 840
   D. 1,000
6. **An ice cream shop offers 5 different toppings. How many different two-topping combinations can be made?**
   A. 10
   B. 20
   C. 25
   D. 30
7. **How many 4-letter words can be formed from the letters in the word 'PROBLEM' if no repetition of letters is allowed?**
   A. 72
   B. 120
   C. 840
   D. 1,680
8. **You have a standard 52-card deck. How many ways can you draw 5 cards?**
   A. 5,984
   B. 10,200

C. 259,896

D. 2,598,960

9. **How many ways can a committee of 4 people be chosen from a group of 10 people?**

   A. 210

   B. 340

   C. 560

   D. 720

10. **In how many ways can the letters in the word 'LEVEL' be arranged?**

    A. 60

    B. 120

    C. 240

    D. 360

11. **How many ways can you arrange 5 books on a shelf if 2 of them must always be next to each other?**

    A. 24

    B. 48

    C. 72

    D. 96

12. **A team needs to select a captain and an assistant captain from 15 players. How many ways can this be done?**

    A. 182

    B. 210

    C. 225

    D. 240

13. **How many different committees can be formed of 3 men and 2 women from a group of 5 men and 4 women?**

    A. 30

    B. 45

    C. 60

    D. 75

14. **If a coin is flipped 5 times, how many possible outcomes are there?**

    A. 16

    B. 24

    C. 32

    D. 64

15. **How many different ways can you form a committee of 6 people from a group of 10, if one particular person must be included in every committee?**

    A. 56

    B. 63

    C. 72

    D. 84

Random Variables

1. If a die is rolled, what is the probability that the result is greater than 4?

   A. $\frac{1}{2}$

   B. $\frac{1}{3}$

   C. $\frac{1}{6}$

   D. $\frac{1}{4}$

2. A bag contains 3 red, 2 blue, and 5 green marbles. One marble is drawn at random. What is the probability that it is a green marble?

   A. 0.1

B. 0.3

C. 0.5

D. 0.6

3. A card is drawn from a standard deck of 52 playing cards. What is the probability that it is a queen?

A. $\frac{1}{13}$

B. $\frac{1}{4}$

C. $\frac{1}{52}$

D. $\frac{1}{2}$

4. In a class of 20 students, 12 are female. If a student is chosen at random, what is the probability that the student is male?

A. 0.4

B. 0.3

C. 0.6

D. 0.5

5. A spinner is divided into 5 equal sections numbered 1 to 5. If the spinner is spun once, what is the probability of it landing on an even number?

A. $\frac{1}{5}$

B. $\frac{2}{5}$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

6. If two dice are thrown together, what is the probability that the sum is 7?

A. $\frac{1}{6}$

B. $\frac{1}{12}$

C. $\frac{1}{36}$

D. $\frac{1}{18}$

7. A jar contains 4 black, 3 white, and 3 blue marbles. One marble is picked randomly. What is the probability that it is either black or blue?

A. 0.5

B. 0.6

C. 0.7

D. 0.8

8. What is the probability of flipping a fair coin three times and getting exactly two heads?

A. $\frac{1}{8}$

B. $\frac{3}{8}$

C. $\frac{1}{4}$

D. $\frac{1}{2}$

9. A box contains 8 black, 5 white, and 7 red balls. If a ball is drawn at random, what is the probability that it is not red?

A. 0.25

B. 0.5

C. 0.625

D. 0.75

10. Three coins are tossed. What is the probability of getting at least one head?

A. $\frac{1}{8}$

B. $\frac{3}{8}$

C. $\frac{5}{8}$

D. $\frac{7}{8}$

11. What is the probability of drawing an ace or a king from a standard deck of cards?

    A. $\frac{1}{13}$

    B. $\frac{2}{13}$

    C. $\frac{3}{13}$

    D. $\frac{4}{13}$

12. The probability of a light bulb functioning for more than 1000 hours is 0.8. What is the probability that out of 4 bulbs, exactly 3 last more than 1000 hours?

13. A basket has 10 apples and 7 bananas. If one fruit is picked randomly, what is the probability that it is an apple?

    A. 0.3

    B. 0.4

    C. 0.6

    D. 0.7

14. If a number is chosen at random from 1 to 10, what is the probability that it is a prime number?

    A. 0.1

    B. 0.3

    C. 0.4

    D. 0.5

15. In a lottery, a player chooses 3 numbers from a pool of 15. What is the probability of choosing all 3 correctly if the order does not matter?

Expected Value

1. **A fair die is rolled. What is the expected value of the outcome?**
   A. 2.5

   B. 3.5

   C. 4.5

   D. 5

2. **A bag contains 3 red balls and 2 blue balls. A ball is drawn at random. If a red ball is drawn, you win \$4. If a blue ball is drawn, you lose \$3. What is the expected value of this game?**
   A. \$0

   B. \$0.20

   C. \$1

   D. \$1.20

3. **A lottery ticket costs \$5 and offers a \$100 prize with a probability of 1/200. What is the expected value of buying a lottery ticket?**
   A. -\$4.50

   B. -\$4

C. -$2

D. $0

4. **In a game, you roll a die and win the number on the die in dollars. What is the expected value of your winnings?**
   A. $2

   B. $3

   C. $3.50

   D. $4

5. **A box contains 10 chocolates: 4 milk, 3 dark, and 3 white chocolates. You pick a chocolate at random. If it's milk, you get 1 point; if it's dark, you get 2 points; if it's white, you get 3 points. What is the expected point value per pick?**
   A. 1.7

   B. 2.0

   C. 2.3

   D. 2.7

6. **What is the expected value of the sum of numbers when two fair dice are rolled?**
   A. 6

   B. 6.5

   C. 7

   D. 7.5

7. **A raffle ticket costs $2 and prizes of $10, $50, and $100 are awarded with probabilities of 0.1, 0.05, and 0.01 respectively. What is the expected value of purchasing a raffle ticket?**
   A. $0.50

   B. $1

   C. $1.50

   D. $2

8. **In a game, you toss a coin three times. You win $5 for each head and lose $3 for each tail. What is the expected value of this game?**
   A. $1

   B. $2

   C. $3

   D. $4

9. **You invest in a stock with a 60% chance of a 10% return and a 40% chance of a 20% loss. What is the expected return percentage?**
   A. -4%

   B. -2%

C. 0%

D. 2%

10. **A spinner is divided into 8 equal sections numbered 1 through 8. What is the expected value of the score obtained by a single spin?**

A. 3.5

B. 4.0

C. 4.5

D. 5.0