1. Which one of the conics is represented by the equation $x^2 - 4x + 3y^2 - 6y - 2 = 0$
   a) hyperbola  b) parabola  c) ellipse  d) circle  e) none of the above

2. Find the asymptotes of the hyperbola $\frac{y^2}{9} - \frac{x^2}{16} = 1$
   a) $y = \pm \frac{3}{4}x$  b) $y = \pm \frac{4}{3}x$  c) $y = \pm 4x$  d) $y = \pm 3x$

3. Find the center of the ellipse given by the equation $x^2 + 4y^2 - 2x + 16y + 13 = 0$
   a) (1,2)  b) (-2,-2)  c) (-2,2)  d) (1,-2)  e) (-1,2)

4. Solve the following system of equations. Find the product $x \cdot y$
   \[
   \begin{align*}
   2x - y &= 3 \\
   3x + 2y &= 8
   \end{align*}
   \]
   a) $x \cdot y = -4$  b) $x \cdot y = -2$  c) $x \cdot y = 0$  d) $x \cdot y = 2$  e) $x \cdot y = 4$

5. Solve the following system of equations. Find $y$.
   \[
   \begin{align*}
   x + 2y + 3z &= 1 \\
   x + 3y + 2z &= 8 \\
   x + y + z &= 3
   \end{align*}
   \]
   a) $y = -4$  b) $y = -1$  c) $y = 0$  d) $y = 1$  e) $y = 4$
6. \[ \frac{-2}{x(x-1)} = \frac{A}{x} + \frac{B}{x-1} \] Find the product \( A \cdot B \)

a) \( A \cdot B = -16 \)  

b) \( A \cdot B = -4 \)  

c) \( A \cdot B = 0 \)  

d) \( A \cdot B = 2 \)  

e) \( A \cdot B = 4 \)

7. Which expression should be used to find the partial fraction decomposition of \( \frac{x^2 - 3x + 5}{x(x-1)(x+1)^2} \)

a) \( \frac{A}{x^2 + 4x - 2} + \frac{B}{x} + \frac{C}{(x + 1)^2} \)

b) \( \frac{A}{x} + \frac{B}{x - 1} + \frac{C}{(x + 1)} + \frac{Dx + E}{(x + 1)^2} \)

c) \( \frac{A}{x} + \frac{B}{x + 1} + \frac{C}{(x + 1)^2} \)

d) \( \frac{A}{x} + \frac{B}{x - 1} + \frac{C}{(x + 1)} + \frac{D}{(x + 1)^2} \)

e) \( \frac{A}{x} + \frac{B}{x - 1} + \frac{Cx + D}{(x + 1)^2} \)

8. How many solutions of the following system of equations are there?

\[ \begin{align*}
\frac{x^2}{9} + \frac{y^2}{25} &= 1 \\
x^2 - 1 &= y
\end{align*} \]

a) 0  

b) 1  

c) 2  

d) 3  

e) 4
9. Solve the following system of equations. What is the sum of all possible y value(s)?

\[
\begin{align*}
&x^2 - y^2 = 7 \\
&x + y = 1
\end{align*}
\]

a) -4    b) -3    c) 0    d) 3    e) 4

10. Find the second term in the sequence defined by \( \binom{(-4)^n}{n+2} \)

a) 1/2    b) 4    c) 16    d) -2    e) 1

11. Find the sum \( \sum_{n=1}^{4} 3^n \)

a) 12    b) 30    c) 81    d) 120    e) none of the above.

12. The sequence given by \( a_n = 3(n - 1) \) is:

a) geometric    c) both arithmetic and geometric
b) arithmetic    d) neither arithmetic nor geometric

13. Find the 101st term of the arithmetic sequence \{2, 8, 14, 20, . . . \}

a) 398    b) 602    c) 620    d) 662    e) 1212

14. Find the arithmetic sum \( 2 + 5 + 8 + \ldots + 101 \)

a) 116    b) 1734    c) 1751    d) 1750
15. What is the sum of the first five terms of the sequence defined by the recursive equations:
   \[ s_1 = 1, \quad s_n = 2s_{n-1} \]
   
a) 16          b) 15          c) 31          d) 63          e) none of the above

16. The first term of a geometric sequence is 2 the common ratio is 3. What is the 4\textsuperscript{th} term?
   
a) 54          b) 24          c) 162          d) 18          e) none of the above

17. Find the infinite geometric sum
   \[ 1 + \frac{1}{4} + \frac{1}{4^2} + \frac{1}{4^3} \ldots \]
   
a) \frac{4}{5}          b) \frac{4}{3}          c) \frac{3}{4}          d) \frac{\sqrt{2}}{2}

18. In using mathematical induction to prove that
   \[ 1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n + 1)(2n + 1)}{6} \]
   what term must be added to the left side of the equation when \( n \) is replaced by \( n + 1 \).
   
a) \( n \)          b) \( n^2 \)          c) \( (n + 1) \)          d) \( 2n + 1 \)          e) \( (n + 1)^2 \)          f) \( (2n + 1)^2 \)

19. Let \( A = \{1,2,5,6,8,9\} \), \( B = \{1,2,5,7,9\} \), and \( C = \{0,2,6,7,8,9\} \).
   Find \( (A \cup B) \cap C \). 
   
a) \{2, 9\}          b) \{2, 8, 9\}          c) \{2, 6, 7, 9, 8\}          d) \{ 0, 1, 2, 4, 7, 8, 9\}

20. Let \( n(C) = \) the number of elements in a set \( C \). If \( A \) and \( B \) are sets and if \( n(A \cap B) = 15 \), \( n(A) = 27 \) and \( n(B) = 21 \). Find \( n(A \cup B) \).
   
a) 6          b) 48          c) 42          d) 36          e) 27          f) 33
Answers

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