1. Find the directrix of the parabola given by $y^2 = 8x$.

A) $x = 2$
B) $x = -2$
C) $x = -\frac{1}{2}$
D) $y = 2$
E) $y = -2$

2. Find the sum of the infinite series that begins $1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \ldots$.

A) $\frac{4}{3}$
B) $\frac{3}{4}$
C) $\frac{5}{3}$
D) $\frac{7}{6}$
E) 1

3. Find the equation of the ellipse with center at (0, 0), foci on the y-axis, x-intercepts at $\pm 3$, and y-intercepts at $\pm 8$.

A) $\frac{x^2}{64} + \frac{y^2}{9} = 1$
B) $\frac{x^2}{9} + \frac{y^2}{64} = 1$
C) $\frac{x^2}{64} - \frac{y^2}{9} = 1$
D) $\frac{x^2}{8} + \frac{y^2}{3} = 1$
E) $\frac{x^2}{3} + \frac{y^2}{8} = 1$

4. Evaluate: $\sum_{j=4}^{12} 10$

A) 80
B) 90
C) 120
D) 130
E) None of these.
5. Find the center of the hyperbola given by \( \frac{(x+1)^2}{25} - \frac{(y-3)^2}{49} = 1 \).

A) (5, 7)  
B) (–5, –7)  
C) (1, –3)  
D) (–1, –3)  
E) (–1, 3)

6. Find the amount of an annuity that consists of 23 annual payments of $5000 each into an account that pays 11% interest per year.

A) $227,870  
B) $455,739  
C) $546,649  
D) $955,739  
E) None of these.

7. Find the vertex of the parabola given by \( (x-2)^2 = 4y + 28 \).

A) (2, 7)  
B) (2, –7)  
C) (–2, 7)  
D) (–2, –7)  
E) None of these.

8. Find the second term of the sequence given by \( a_n = \frac{(-1)^{n-1} n}{n+2} \).

A) \( \frac{1}{2} \)  
B) \( -\frac{1}{2} \)  
C) 2  
D) –2  
E) None of these.

9. Find the 100th term of the arithmetic sequence that begins 26.2, 31.2, 36.2, 41.2, ….

A) 521.2  
B) 526.2  
C) 531.2  
D) 2620  
E) 27,370
10. Find the equation of the hyperbola with center at (0, 0), one vertex at (4, 0) and asymptote $y = 5x$.

A) $\frac{x^2}{16} - \frac{y^2}{400} = 1$
B) $\frac{x^2}{400} - \frac{y^2}{16} = 1$
C) $\frac{y^2}{16} - \frac{x^2}{400} = 1$
D) $\frac{x^2}{16} - \frac{y^2}{25} = 1$
E) None of these.

11. Telephone poles are stored in a pile with 40 poles in the first layer, 39 in the second, and so on. If there are 12 layers, how many poles are in the pile?

A) 52
B) 375
C) 408
D) 414
E) None of these.

12. A “sunburst” window above a doorway is constructed in the shape of the top half of an ellipse. The window is 24 inches tall at its highest point and 96 inches wide at the bottom. Find the height of the window 10 inches from the center of the base. Round your answer to the nearest tenth of an inch.

A) 5.8 inches
B) 6.1 inches
C) 6.8 inches
D) 23.5 inches
E) 24.5 inches

13. Given $\mathbf{u} = \langle 6, 9 \rangle$ and $\mathbf{v} = \langle -3, 5 \rangle$, find $3\mathbf{u} - 6\mathbf{v}$.

A) $\langle 9, 4 \rangle$
B) $\langle 36, 4 \rangle$
C) $\langle 36, -3 \rangle$
D) $\langle 0, 0 \rangle$
E) $\langle 9, -3 \rangle$
14. Find the angle between \( <4, 3> \) and \( <-1, -2> \). Round your answer to the nearest degree.

A) 27°
B) 63°
C) 203°
D) 153°
E) None of these.

15. Find the direction of the vector \( <9, -8> \). Round your answer to the nearest degree.

A) 41°
B) 42°
C) 139°
D) 318°
E) 319°

16. Which of the following pairs of vectors are orthogonal?

A) \( <1, 4> \) and \( <3, 1> \)
B) \( <5, 0> \) and \( <0, -1> \)
C) \( <-1, -4> \) and \( <3, 3> \)
D) \( <4, -6> \) and \( <3, -5> \)

17. Find the magnitude of the vector \( <4, -4> \).

A) 0
B) 4
C) 16
D) \( 4\sqrt{2} \)
E) None of these.