Choice E, NOTA, stands for "None of the above answers is correct."

1. Known as "The Great Geometer," this Greek mathematician is credited for giving the conic sections their names (parabola, ellipse, hyperbola).
   A. Aristotle B. Zeus C. Apollonius D. Sampras E. NOTA

2. Find the center of the circle defined by $4-2x^2-16x-2y^2+12y=6$.
   A. (4, –3) B. (–4, 3) C. (8, –6) D. (–8, 6) E. NOTA

3. Find the distance between the points (3, 5) and (–7, 6).
   A. $\sqrt{17}$ B. $\sqrt{99}$ C. 10 D. $\sqrt{101}$ E. NOTA

4. Find the shortest distance from the point (5, 3) to the asymptote with positive slope of the hyperbola $16x^2-64x-9y^2+54y=161$.
   A. $\frac{9}{5}$ B. $\frac{12}{5}$ C. $\frac{7\sqrt{5}}{5}$ D. 6 E. NOTA

5. Sarah lives at point $(x, y)$ on the hyperbola $9x^2+54x-16y^2+64y-127=0$. Her school is located at the point (–8, 2) and her friend Annemarie lives at (2, 2). If Sarah always walks in a straight line, what is the positive difference between the distance from Sarah's house to school and the distance from Sarah's house to Annemarie's house? All answers are in units.
   A. 5 B. 32 C. 16 D. 8 E. NOTA

6. Nikitha lives at a point on the directrix that is closer to Annemarie's house (from problem 5). Find the equation of this line.
   A. $x=\frac{1}{5}$ B. $x=\frac{25}{4}$ C. $x=-\frac{7}{4}$ D. $x=-\frac{11}{5}$ E. NOTA

7. Find the area of the circle having for diameter the segment of the graph of $4x-5y=4$ that is cut off by the coordinate axes.
   A. $\frac{41}{100}\pi$ B. $\frac{3}{5}\pi$ C. $\frac{\sqrt{41}}{10}\pi$ D. $\frac{41}{25}\pi$ E. NOTA

8. Under what conditions placed on $A$, $B$, and $C$ will the graph of $x^2+y^2+Ax+By+C=0$ be a point?
   A. $A+B=C$ B. $A+B+C=0$ C. $A^2+B^2=4C$ D. $A^2+B^2=-4C$ E. NOTA

9. Given equations I, II, III, IV, and V, rank their eccentricities from least to greatest.
   I. $y^2=-8x$ II. $x^2+3y^2=2$ III. $9y^2-4x^2=36$ IV. $3x^2+3y^2=2$ V. $xy=-10$
   A. IV, II, I, V, III B. IV, II, I, III, V C. IV, I, V, III, II D. IV, III, V, II, I E. NOTA

10. The system of equations $\begin{cases} x^2+y^2=1 \\ y=x^2 \end{cases}$ has two real solutions and two imaginary solutions. The $y$-coordinate that produces imaginary values for $x$ is $y=-\frac{1}{2}\left(a+\sqrt{b}\right)$, where $a$ and $b$ are integers. Find $a+b$.
    A. 3 B. 4 C. 5 D. 6 E. NOTA

11. The system of equations $\begin{cases} x^2-3y^2=1 \\ 2x+3y=7 \end{cases}$ has two real solutions. Find the sum of the ordinates of these two solutions.

A. 0 B. 7 C. 14 D. 28 E. NOTA

12. The opening of a tunnel is in the shape of the upper half of an ellipse 152 feet wide and 38 feet high. Find the height, in feet, of the arch 19 feet from the center of the tunnel.

A. $\frac{19\sqrt{17}}{2}$ B. $\frac{19\sqrt{15}}{2}$ C. $\frac{19\sqrt{15}}{4}$ D. $\frac{19\sqrt{17}}{4}$ E. NOTA

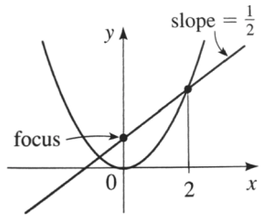
13. The focus of a parabola is 2.25 feet from its vertex. Find the shortest distance from the focus to the directrix of this parabola. All answers are in feet.

A. 4.5 B. 2.25 C. 6.75 D. 9 E. NOTA

14. Find the area contained in the region defined by $4x^2+9y^2\le 36$.

A. $36\pi$ B. $3\pi$ C. $24\pi$ D. $6\pi$ E. NOTA

15. A line with slope 0.5 passes through the focus of a parabola with vertex (0, 0), as shown. Find the focal width of the parabola.




A. $\frac{1+\sqrt{5}}{2}$ B. $2\sqrt{5}-2$ C. $2\sqrt{5}+2$ D. $\frac{3+\sqrt{5}}{2}$ E. NOTA

16. Find the length of the latus rectum of the hyperbola with vertices $(0,\pm 8)$ and asymptotes $y=\pm\frac{4}{3}x$.

A. 4.5 B. $\frac{32}{3}$ C. $\frac{64}{3}$ D. 9 E. NOTA

17. Find the area of the region bounded by the *y*-axis and the graph of $x\le\sqrt{16-y^2}$.

A. $16\pi$ B. $4\pi$ C. $8\pi$ D. $128\pi$ E. NOTA

18. What transformation of the parent function, $f(x)=x^2$, is the function $f(x)=-(x+2)^2$?

A. reflect across *x*-axis and translate right 2 B. reflect across *y*-axis and translate up 2
C. reflect across *x*-axis and translate left 2 D. reflect across *y*-axis and translate down 2
E. NOTA

19. The surface design of a rectangular ceiling panel, 20 ft. by 25 ft., calls for tracing out a pair of conjugate hyperbolas with the diagonals of the panel as asymptotes and with the vertices closest to the center 2 feet apart. Determine how broad the least eccentric hyperbola will be at a distance on its transverse axis 5 feet from the center.

A. 8 B. $2\sqrt{15}$ C. $2\sqrt{17}$ D. $5\sqrt{6}$ E. NOTA

20. Identify the graph of $9x^2-y^2+4y=4$.

A. hyperbola B. no graph C. point D. intersecting lines E. NOTA

21. Identify the graph of $9x^2+4y^2+54x-16y=-97$.
A. ellipse B. no graph C. point D. intersecting lines E. NOTA

22. A point moves so that its distance from (4, 0) is always half its distance from the line $x-16=0$. Find the equation of its locus.
A. $3x^2+4y^2=192$ B. $x^2+16x+2y^2-224=0$ C. $x^2+y^2=25$
D. $y=\sqrt{3x-8}$ E. NOTA

23. The graph of the equation $xy-2x+y-3=0$ is a:
A. circle B. hyperbola C. ellipse D. semi-ellipse E. NOTA

24. For any real value of *x*, the maximum value of $8x-3x^2$ is:
A. 0 B. $\frac{4}{3}$ C. $\frac{8}{3}$ D. 4 E. NOTA

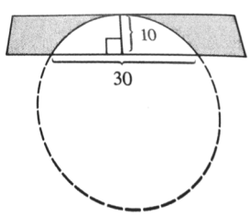
25. Consider parabolas of the form $y=x^2+bx+c$. How many such functions have real *x*-intercepts and have coefficients *b* and *c* selected from the set of integers $\{1,2,3,4,5,6\}$?
A. 20 B. 19 C. 18 D. 17 E. NOTA

26. The line $y=mx+1$ intersects the ellipse $x^2+4y^2=1$ exactly once. Find the value of $m^2$.
A. $\frac{1}{2}$ B. $\frac{2}{3}$ C. $\frac{3}{4}$ D. $\frac{4}{5}$ E. NOTA

27. Find the length of the minor axis of the ellipse with center (–2, 4), vertex (3, 4), and associated focus (2, 4).
A. 6 B. 3 C. 9 D. 4.5 E. NOTA

28. Find the area of the triangle whose vertices are the vertex and latus rectum endpoints of $9y^2-16x=144$.
A. $\frac{64}{81}$ B. $\frac{32}{81}$ C. $\frac{16}{81}$ D. $\frac{128}{81}$ E. NOTA

29. The circular arch shown at the right has height 10 ft and width 30 ft. Find the radius of the complete circle.
A. $5\sqrt{13}$ B. 18 C. 18.25 D. 21.25 E. NOTA




30. The circle containing the points (–2, 2), (4, 2), and (2, –2) can be written in the form $x^2+y^2+ax+by+c=0$. Find the product *abc*.
A. –32 B. –22 C. 34 D. 24 E. NOTA