<u>E is None of These</u>

1. The number of distinct points between the graphs of the curves $r^2 = 4\cos 2\theta$ and $r = 2\sqrt{2}\sin\theta$ is

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

2. Which of the following best describes the 3-D graph of the equation $x^2 + 4xy + 4y^2 - z^2 = 0$?

   A. an elliptic cone   B. a hyperboloid of one sheet

   C. two lines   D. two planes

3. A parabola contains $(-5,0),(0,1),$ and $(7,2)$ and its axis of symmetry is perpendicular to the y-axis. Find the y-coordinate of the vertex.

   A. -9 B. -5 C. -2 D. 0

4. Circle O has radius r. If sector COD has a perimeter 10 and area 4, find the sum of all possible values of r.

   A. $\frac{4}{5}$ B. 1   C. 4   D. 5

5. The polar graph $r^2 = \sec 2\theta$ is a

   A. circle   B. 4 leaf rose   C. hyperbola   D. lemniscates

6. For a certain ellipse, the distance between a focus and the closer vertex is 2. If the length of the minor axis is $4\sqrt{5}$, find the length of the major axis.

   A. 6   B. 12   C. 24   D. 42

7. Express the equation $x^2 + xy + y^2 = 1$ in polar coordinates r and θ.

   A. $r^2 + \cos\theta\sin\theta = 1$ B. $r^2 + r\cos\theta\sin\theta = 1$

   C. $r^2\sin^2\theta + r\cos\theta\sin\theta = 1$ D. $r^2(1 + \cos\theta\sin\theta) = 1$

8. Express $r = \dfrac{6}{2 + \cos\theta}$ in rectangular form.

   A. $3(x+2)^2 + 4y^2 = 48$ B. $3(x+2)^2 - 4y^2 = 4$

   C. $4(x+2)^2 + 3y^2 = 4$ D. $4(x+2)^2 - 3y^2 = 4$

9. Which of the following best describes the following equation $y^2 - 4xy + 4x^2 - 2x + y - 12 = 0$?

   A. No Graph   B. 2 parallel lines   C. hyperbola   D. ellipse

10. Place in order from smallest to largest in terms of eccentricity: Parabola (P), Ellipse (E), Hyperbola (H), Circle (C).

   A. C,E,P,H   B. C,H,P,E   C. C,E,H,P   D. P,E,H,C

11. Find the values of r for which the circle $x^2 + y^2 = r^2$ intersects the line $2x + y = 5$.

   A. $|r| \geq \sqrt{5}$ B. $r > \sqrt{5}$ C. $r \geq 5$ D. $|r| > 2\sqrt{5}$

12. If the eccentricity of a conic is 3, find the number of linear permutations of the letters in the name of the conic.

   A. 360   B. 6720   C. 1260   D. 362880

13. A triangle having sides 7, 8, and 9 is inscribed in a circle O. find the radius of the circle.

   A. $\sqrt{5}$ B. $\dfrac{2\sqrt{5}}{21}$ C. $\dfrac{21\sqrt{5}}{5}$ D. $\dfrac{21\sqrt{5}}{10}$

14. Which equation represents the set of points for which the distances to $(4,0)$ and $(-4,0)$ sum to 10?

   A. $25x^2 + 9y^2 = 225$ B. $9x^2 - 25y^2 = 225$

   C. $9x^2 + 25y^2 = 225$ D. $9x^2 + 16y^2 = 144$

15. Which of the following equations represent the graph of $x^2 - y^2 = 2$ rotated $45°$ counterclockwise around the origin?

   A. $xy = 1$ B. $xy = -1$ C. $xy = 2$ D. $x^2 y^2 = 1$

16. A circle of radius 13 is circumscribed about a regular 24-sided polygon. Find the area of the polygon.

   A. $507\left(\sqrt{6} + \sqrt{2}\right)$ B. $507\left(\sqrt{6} - \sqrt{2}\right)$ C. $169\left(\sqrt{6} + \sqrt{2}\right)$ D. $169\left(\sqrt{2} - \sqrt{6}\right)$

17. If the equation of the perpendicular bisector of the segment connecting the intersection points of the graphs of $x^2 - 6x + y^2 - 4y - 12 = 0$ and $y = x$, is written in $Ax + By = C$ form, what is $A + B + C$?

   A. - 3   B. -1 C. 3   D. 1

18. If the locus of points equidistant from the point $(6,8)$ and the line $4x+3y=4$ were written in the form $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$, such that A, B, C, D, E, and F are relatively prime and A > 0, find $A+B+C+D+E+F$.

    A. 1816   B. 1841   C. 1889   D. 2377

19. The graph $r = 3+2\cos\theta$ is a(n)

    A. limaçon with inner loop   B. Cardioid
    C. dimpled limaçon   D. convex limaçon

20. Find the area of the circle defined by the polar equation $r^2 - 8r\cos\theta + 6r\sin\theta = 0$.

    A. 36π B. 25π C. 16π D. 9π

21. Find the volume of an elliptic cone whose base is given by the graph $16x^2 + 9y^2 + 64x - 18y - 71 = 0$ and whose vertex is 10 units above the center of the base.

    A. 120π B. 60π C. 40π D. 20π

22. An arch is in the form of a semi-ellipse. It is 48 feet wide at the base and has a height of 20 feet. How wide is the arch at the height 10 feet above the base?

    A. $12\sqrt{3}$ B. $12\sqrt{2}$ C. $6\sqrt{3}$ D. $6\sqrt{2}$

23. Find the center of the circle with equation $4x^2 + 4y^2 - 16x - 8y - 180 = 0$.

    A. $(2,1)$ B. $(2,-1)$ C. $(-2,1)$ D. $(-2,-1)$

24. Given the equation $8x^2 - 12xy - 8y^2 + 6\sqrt{10}x - 2\sqrt{10}y = 30$, find the measure of the acute angle, to the nearest degree, that will eliminate the xy term.

    A. $18°$ B. $37°$ C. $45°$ D. $72°$

25. Omit

26. Which of the following is the ordered pair for the y- intercept for the given equation: $y - 6 = 7(x+4)$.

    A. $(0,28)$ B. $(0,22)$ C. $(0,4)$ D. $(0,-34)$

27. The graph of $x^2 - y^2 - 2x - 4y - 4 = 0$ is the equation of which one of the following?

    A. circle   B. ellipse   C. hyperbola   D. parabola

28. Find the center of the graph in the above problem #27.

    A. $(1,2)$ B. $(1,-2)$ C. $(-1,-2)$ D. $(-1,2)$

29. Find the coordinates of the turning point of the curve $y = x^2 - 8x + 15$.

    A. $(0,-1)$ B. $(2,0)$ C. $(4,-1)$ D. $(5,0)$

30. Given the following coordinates that each lie on the circumference of circle O: , determine the center of circle O: $(-2,0), (6,6)$, and $(5,7)$.

    A. $(3,2)$ B. $(2,3)$ C. $(1,3)$ D. $(3,4)$

Tiebreakers

1.Find the value of k such that $y = x^2 - 6x + k$ is tangent to the $x-$ axis.

2. Find the area of the circle given by $2x^2 + 2y^2 - 4x + 8y - 6 = 0$.

3. Three circles of radius 4 are externally tangent to each other. A band is wrapped tightly around the outside of the circles. Find the length of the band.