

Unless otherwise specified, all variables are defined over the REAL NUMBERS, and ellipses refer to non-circular ellipses only. Good luck and have fun - you're in Vegas!

- What is the area of a triangle with sides 5, 6, and 7?
A. $3\sqrt{6}$ B. $6\sqrt{6}$ C. 9 D. 15 E. NOTA
- Which conic section is defined as the locus of points for which the absolute difference of the distances to two fixed points is constant?
A. Ellipse B. Hyperbola C. Parabola D. Circle E. NOTA
- What is the area of the triangle bound by the x-axis, the y-axis, and the line $5x + 3y = 30$?
A. 10 B. 15 C. 30 D. 60 E. NOTA
- Nick's fishface is the region bounded by the x-axis and the graph of $2y = \sqrt{16 - x^2}$. What is the area of Nick's fishface?
A. 2π B. 4π C. 8π D. 16π E. NOTA
- What is the length of the latus rectum of the parabola with focus at the point (2, 1) and directrix $3x - 4y = 3$?
A. $\frac{1}{5}$ B. $\frac{2}{5}$ C. $\frac{4}{5}$ D. $\frac{8}{5}$ E. NOTA
- What is the area of the convex quadrilateral defined by the points (1, 2), (2, 5), (3, -2), and (6, 3)?
A. 6 B. 12 C. 18 D. 36 E. NOTA

7. When graphed in the complex plane, what is the area of the region defined by the graph $|z| \leq 5$, where z is a complex number?
- A. 5π B. 10π C. $\frac{25\pi}{2}$ D. 25π E. NOTA
8. For complex number x , when the roots of $x^3 = 1$ are plotted in the complex plane, they can be connected to form a convex polygon. What is the area of the region enclosed by the polygon?
- A. $\frac{3\sqrt{3}}{4}$ B. $\frac{3\sqrt{3}}{2}$ C. $3\sqrt{3}$ D. 3 E. NOTA
9. What is the length of the minor axis of the ellipse $3x^2 + 4y^2 - 6x + 12y - 24 = 0$?
- A. $2\sqrt{3}$ B. $4\sqrt{3}$ C. 3 D. 6 E. NOTA
10. What is the eccentricity of the conic defined by the graph $3x^2 + 7x - 10y = 69$?
- A. 0 B. 1 C. $\frac{3}{7}$ D. ∞ E. NOTA
11. Ouige Onion is in the shape of an ellipse with eccentricity $\frac{3}{5}$. If the length of the minor axis is 12, what is the area of Ouige Onion?
- A. 24π B. 45π C. 48π D. 90π E. NOTA
12. There's awards in this house.... There's awards in this house.... Help! Nick's bars are so hot that they've caused a fire! If the fire is at (10, 9), and Nick is at (12, 1), what is the shortest distance Nick can take to put out the fire if he must first stop at the river represented by the line $x = 8$ to get water?
- A. $2\sqrt{17}$ B. $4\sqrt{2} + 2\sqrt{5}$ C. $4 + 2\sqrt{17}$ D. $2 + 4\sqrt{5}$ E. NOTA

13. When graphed, the parabola defined by the graph $x + 2 = y^2 - 4y$ and the line $x + y = 8$ intersect at two points. What is the area of the triangle defined by these two intersection points and the vertex of the parabola?
- A. 21 B. 42 C. 50 D. 84 E. NOTA
14. Triangle KJN has side KJ with length 6 and side JN with length 9. If angle J is 60° , what is the length of KN?
- A. 6 B. $3\sqrt{5}$ C. $3\sqrt{7}$ D. $3\sqrt{13}$ E. NOTA
15. Which of the following is an equation of an asymptote of the hyperbola:
 $3x^2 - 12y^2 - 12x + 72y - 144 = 0$?
- A. $2x - y - 1 = 0$ B. $x - 2y + 1 = 0$
C. $2x + y - 7 = 0$ D. $x + 2y - 8 = 0$ E. NOTA
16. At how many points do the circle $x^2 + y^2 - 2x + 2y - 7 = 0$ and the parabola $y = 4x^2 - 8x$ intersect?
- A. 1 B. 2 C. 3 D. 4 E. NOTA
17. What is the distance between the foci of the graph $2x^2 - 3y^2 + 4x - 12y - 34 = 0$?
- A. 4 B. $2\sqrt{2}$ C. $2\sqrt{5}$ D. $4\sqrt{10}$ E. NOTA
18. There exists a circular sector with radius 12 and central angle 120° . The two straight edges of the sector are brought together to make a cone. What is the volume of this cone?
- A. 64π B. $\frac{128\pi}{3}$ C. $24\pi\sqrt{3}$ D. $\frac{128\pi\sqrt{2}}{3}$ E. NOTA

19. What is the length of a latus rectum of the ellipse $2x^2 + 3y^2 - 16x + 42y + 35 = 0$?
- A. $2\sqrt{6}$ B. $4\sqrt{6}$ C. $4\sqrt{2}$ D. $8\sqrt{2}$ E. NOTA
20. When graphed over the real numbers, which of the following could not be a degenerate conic section?
- A. Point B. Two Lines (Parallel) C. Two Lines (Intersecting) D. One Line E. NOTA
21. What is the shortest distance from the point $(-3, 9)$ to the circle $x^2 + y^2 - 12x + 6y - 19 = 0$?
- A. $\sqrt{161}$ B. 7 C. 8 D. 15 E. NOTA
22. What is the area of the triangle defined by the vertex and the two x-intercepts of the parabola $y + 9 = 10x - x^2$?
- A. 16 B. 32 C. 64 D. 128 E. NOTA
23. What is the area bound by the graph $y = 5 - |x - 4|$ and the x-axis?
- A. 10 B. 20 C. 25 D. 50 E. NOTA
24. The point on the line $3x - 2y = 5$ that is closest to the point $(9, -2)$ is (a, b) . Compute the value of $a + b$.
- A. 3 B. 5 C. 7 D. 9 E. NOTA
25. What is the maximum area of a right triangle inscribed in a circle with radius 6?
- A. $18\sqrt{3}$ B. 36 C. $36\sqrt{3}$ D. 72 E. NOTA

