1. Convert into rectangular coordinates: = r
   1. y4 – 4y2 + 4xy2 = 0 b. x2 + y2 = 4 c. 4x2y = 1 – x

d. 2x2 – 2x + y2 = 0 e. NOTA

1. What is the equation of the circle that is tangent to the lines y=0, x=0, and 15y + 8x = 120?
   1. x2 – 4x + y2 – 4y + 4 = 0 b. x2 + y2 = 9

c. x2 + y2 – 6x– 6y + 9 = 0 d. x2 + y2 – 2x– 4y + 16 = 0 e. NOTA

1. Given quadrilateral ABCD (where points A and C are points on an ellipse, and points B and D are the on the foci of the ellipse). The ellipse is defined by the equation, where |a| < 3. What is the perimeter of ABCD?
   1. 16 b. 12 c. 20 d. 4 e. NOTA
2. A truck that is 10 feet wide must pass through an elliptically-shaped tunnel with a base of 20 feet and a maximum height of 30 feet. What is the greatest height the truck can have and still fit through the tunnel?
   1. b. 14 c. 17 d. e. NOTA
3. What is the length of a petal in the rose curve ?
   1. 12 b. 16 c. 4 d. 2 e. NOTA
4. How many paths can you take from the point (-3,-2) to the point (1, 5), if you can only move up or to the right one unit at a time?
   1. 420 b. 330 c. 702 d. 540 e. NOTA
5. What is the volume of a torus that has an inner radius of 5 and an outer radius of 7?
   1. b. c. d. e. NOTA
6. Find the area of the shaded region, if the largest square  
   has a side length of 10 and the squares continue infinitely:
   1. b. 50

c. d. e. NOTA

1. What is the volume when the curve is rotated around the line y=3?
   1. b. c. d. 125 e. NOTA
2. What is the area of the quadrilateral formed when the fourth roots of 16 are graphed on the Argand (complex) plane?
   1. 16*i* b. 8 c. 4 d. 6*i* e. NOTA
3. Which is a possible final vertex of the parallelogram with vertices at (-1,-2), (2,2), and (1,3)?
   1. (0,0) b. (-1,-1) c. (7,4) d. (3,1) e. NOTA
4. What does the equation look like when graphed on the Argand (complex) plane?
   1. circle b. ellipse c. hyperbola d. line e. NOTA
5. What is the volume of the three-dimensional figure defined by the equation:
   1. b. c. d. e. NOTA
6. What is the shortest distance from the point (3,2) to the point (5,-4), if you must first go through a point on the line x=1?
   1. 6 b. 72 c. d. e. NOTA
7. What is the area of the polygon formed by the points (2,3), (4,-1), (5,0), (4,1), and (-2,0)?
   1. b. c. d. 14 e. NOTA
8. 1. 0 b. c. d. e. NOTA
9. Find the horizontal asymptote(s) of
   1. y=0 b. , y=0 c. y=5 d. y= ½ , y=0 e. NOTA
10. What type of conic is defined by the following equation?
    1. Ellipse b. Parabola c. cardioid d. hyperbola e. NOTA
11. A flying reindeer is attached by a rope to the upper corner of a cube-shaped house. The house has a side length of 40 feet, and the rope is 18 feet long. How much volume (in cubic yards) of air can the reindeer fly in?
    1. b. c. d. e. NOTA
12. What is the area of the annulus formed by the two concentric circles? (AB = 8, and the segment is tangent to the smaller circle)
    1. b. c. d. e. NOTA

A

B

1. What is the equation of the line given when y = 3x+9 is reflected about the line y=x?
   1. b.
   2. d. e. NOTA
2. Find the length of the latus rectum of this conic: .
   1. b. c. d. e. NOTA
3. What is the shortest distance between the circles and

?

* 1. b. c. d. e. NOTA

1. What is the volume when the line from x=2 to x=6 is revolved around the x-axis?
   1. b. c. d. e. NOTA
2. Which of the following vectors is perpendicular to <3, -1, 6>?
   1. <2,3,1> b. <1,9,1> c. <1,1,1> d. <1,-3,0> e. NOTA
3. Triangle ABC is circumscribed about the circle. AB = 6. Angle ACB is . What is the  
   radius of the circle? (hint: don’t bother rationalizing denominators for any step or your final answer)
   1. b.

C

c. d. e. NOTA

B

A

1. If , , evaluate:
   1. 0 b. 1 c. -1 d. e. NOTA
2. What is the distance from the point (1,0,2) to the plane 4x-4y+2z=5?
   1. b. c. d. e. NOTA
3. How many intersection points do the graphs of and share?
   1. 1 b. 2 c. 4 d. 6 e. NOTA
4. Express the following parametric curve as a Cartesian function:

* 1. b.

c. d.

e. NOTA