

Mu Alpha Theta National Convention 2004
Open Coordinate Geometry Test

For all questions, answer E) NOTA means none of the above answers is correct.

- 1 The distance from the point $(1,2)$ to line $3x + 4y - 1 = 0$ is:
A) 0 B) -1 C) 2 D) 5 E) NOTA The equation
- 2 The two circles: $x^2 - 4x + y^2 - 6y - 36 = 0$ and $x^2 - 28x + y^2 + 4y + 164 = 0$ intersect in:
A) 2 points B) no points C) 3 points
D) 1 point E) NOTA
- 3 $x^2 + 2y^2 + 3xy^2 + 2x + y + 1 = 0$ represents:
A) a circle B) a parabola C) an ellipse
D) a hyperbola E) NOTA
- 4 The line in the plane that goes through the points $(3,6)$ and $(5,11)$ intersects the x-axis at the point:
A) $\left(\frac{3}{5}, 0\right)$ B) $\left(\frac{2}{5}, 0\right)$ C) $\left(-\frac{3}{2}, 0\right)$ D) $\left(0, -\frac{3}{2}\right)$ E) NOTA
- 5 What is the area bounded by the graph of $|x| + |y| = 4$?
A) 16 B) 32 C) 12 D) 64 E) NOTA
- 6 What is the length of the line segment tangent to the curve $x^2 - 4x + y^2 - 6y + 6 = 0$ from the point $(6, 7)$?
A) $2\sqrt{6}$ B) 4 C) 5 D) $2\sqrt{5}$ E) NOTA
- 7 What are the coordinates of the centroid of the triangle with vertices: $(2, 1)$, $(3, -2)$ and $(7, 7)$?
A) $(3, 3)$ B) $(3, 0)$ C) $(4, 2)$ D) $(2, 4)$ E) NOTA
- 8 Which point is in the plane determined by the points $(-2, 0, 0)$, $(0, 5, 0)$ and $(0, 0, 8)$?
A) $(1, 2, 1)$ B) $(2, -5, 32)$ C) $(-1, 4, 5)$
D) $(3, -1, 4)$ E) NOTA
- 9 Where does the graph of $y = 2x^2 + 8x + 5$ reach its minimum?
A) $(2, -5)$ B) $(-2, -3)$ C) $(-4, 3)$
D) $(4, -13)$ E) NOTA

- 10 What is the equation of the line that is perpendicular to the line: $4x + 3y = 7$ and goes through the point $(2, 1)$?
- A) $4x + 3y = 11$ B) $4x - 3y = 5$ C) $3x + 4y = 10$
D) $3x - 4y = 2$ E) NOTA
- 11 The two lines: $2x - 3y = 7$ and $3x + 2y = 3$ intersect at the point:
- A) $\left(\frac{7}{3}, -\frac{4}{3}\right)$ B) $\left(\frac{7}{12}, -\frac{7}{12}\right)$ C) $\left(\frac{23}{13}, -\frac{15}{13}\right)$
D) $\left(\frac{11}{6}, -\frac{13}{6}\right)$ E) NOTA
- 12 What is the length of the portion of the line: $3x + 4y = 12$ in the first quadrant?
- A) $\sqrt{5}$ B) $\sqrt{7}$ C) 4 D) 5 E) NOTA
- 13 What is the distance between the foci of the ellipse: $\frac{(x-2)^2}{36} + \frac{(y+7)^2}{49} = 1$?
- A) 26 B) $2\sqrt{13}$ C) $\sqrt{13}$ D) 13 E) NOTA
- 14 The distance from the line $5x - 12y + c = 0$; $c > 0$ to the origin is:
- A) $c/13$ B) c C) $-c/5$ D) $c/12$ E) NOTA
- 15 The parabola: $y^2 - 2y - 4x + 9 = 0$ has its focus at the point:
- A) $(0,0)$ B) $(-1,0)$ C) $(1,3)$ D) $(3,1)$ E) NOTA
- 16 The equation $2x^2 - 3xy + y^2 = 0$ represents two straight lines. The lines intersect at the point:
- A) $(1,1)$ B) $(0,0)$ C) $(2,4)$ D) $(7,1)$ E) NOTA
- 17 The parabola $y^2 = 4ax$ is tangent to the straight line $y = mx + c$. If a and m are not zero then:
- A) $mc = a$ B) $m^2a = c$ C) $c^2 = (m+a)^2$
D) $a = m + c$ E) NOTA
- 18 The point $(2\sqrt{2}, 2\sqrt{2})$ is rotated about the origin through an angle of 75° counter-clockwise. The new coordinates are:
- A) $(2\sqrt{3}, -2)$ B) $(-2\sqrt{3}, 2)$ C) $(-2, 2\sqrt{3})$
D) $(-\sqrt{2}, \sqrt{2})$ E) NOTA
- 19 Given the line segment from $(4,3)$ to $(1,7)$ as one side of a right triangle. How many choices are there for the third vertex?
- A) 0 B) 2 C) 4 D) 8 E) NOTA

- 20 When the point $(-4, -5)$ is reflected about the line $y = -2x - 3$, the point is:
 A) $(4, -1)$ B) $(4, 5)$ C) $(2, 0)$ D) $(-2, -7)$ E) NOTA
- 21 What is the area of the convex pentagon with vertices: $(1,5)$, $(4,8)$, $(8,7)$, $(9,2)$ and $(2,1)$?
 A) 44.5 B) 42 C) 39.5 D) 40.5 E) NOTA
- 22 The polar equation: $r = \frac{10}{3 + 2\cos\theta}$ represents a:
 A) circle B) ellipse C) parabola
 D) hyperbola E) NOTA
- 23 Convert the rectangular coordinates $(\sqrt{3}, 3)$ to polar coordinates.
 A) $(3, \pi/3)$ B) $(\sqrt{3}, \pi/6)$ C) $(2\sqrt{3}, \pi/3)$
 D) $(2\sqrt{3}, \pi/6)$ E) NOTA
- 24 What is the center of the circle, wholly in the first quadrant, that has radius 1, and is tangent to the two lines: $3y = 4x$ and $5y = 12x$?
 A) $(1,2)$ B) $(5,20)$ C) $(1,1)$ D) $(4, 7)$ E) NOTA
- 25 The equations of the asymptotes of the hyperbola: $4(x+1)^2 - 9(y-2)^2 = 36$ are:
 A) $2y = 3x + 7$; $2y = -3x + 2$ B) $3y = 2x + 8$; $3y = -2x + 4$
 C) $4y = 9x + 17$; $4y = -9x - 1$ D) $9y = 4x + 22$; $9y = -4x + 14$
 E) NOTA
- 26 How many lobes (petals) does the curve: $r = 2\sin 3\theta$; $0 \leq \theta \leq \pi$ have?
 A) 3 B) 2 C) 6 D) 4 E) NOTA
- 27 The lines $7x + 24y + 12 = 0$ and $14x + 48y - 6 = 0$ are parallel. What is the perpendicular distance between them?
 A) 1.0 B) 1.1 C) 0.5 D) 0.6 E) NOTA
- 28 The curve $x^2 + y^2 - 8x - 6y + 24 = 0$ is reflected about the straight line $y = 2x$. The equation of the reflected curve is:
 A) $x^2 - y^2 - 8x + 6y - 24 = 0$ B) $x^2 + y^2 - 10x + 5y + 24 = 0$
 C) $x^2 + y^2 - 10y + 24 = 0$ D) $x^2 - 3y^2 - 2x + 24 = 0$
 E) NOTA

- 29 What is the unsimplified equation of the circle that passes through the intersection of the two circles: $(x - 1)^2 + (y - 2)^2 = 3$; $(x - 4)^2 + (y + 1)^2 = 5$ and the point $(4,5)$?
- A) $(x - 4)^2 + (y - 3)^2 - 4 = 0$
 B) $31[(x - 1)^2 + (y - 2)^2 - 3] - 15[(x - 4)^2 + (y + 1)^2 - 5] = 0$
 C) $31[(x - 1)^2 + (y - 2)^2 - 18] + 15[(x - 4)^2 + (y + 1)^2 - 36] = 0$
 D) $[(x + 1)^2 + (y + 2)^2 - 65] - [(x + 4)^2 + (y - 1)^2 - 80] = 0$
 E) NOTA
- 30 Two intersecting lines have slopes of 1 and $\frac{17}{7}$. What is the slope of the line that bisects the acute angle formed by these lines?
- A) $\frac{12}{7}$ B) $\frac{3}{2}$ C) $\frac{17}{10}$ D) 2 E) NOTA

Tie Break Questions

- T1 The set of points in the plane that are three times as far from $(3, 8)$ than from $(-2, -7)$ is what kind of graph?
- T2 The points $(1,1)$, $(a, 2)$ and $(3, b)$ are collinear. Write a in terms of b .
- T3 What is the volume of the tetrahedron with vertices $(3, 2, 3)$, $(5, 3, 4)$, $(4, 1, 3)$ and $(3, 5, 2)$?