Topic Test: Analytic Geometry

1   The area of an ellipse is the same as the area of a square with sides of length 8. If
    the length of the minor axis is always two-thirds of the length of the major axis, then
    find the focal length of the ellipse. Round the answer to the nearest hundredth.
    A) 8.22   B)   8.23   C) 8.24
    D) 8.25   E)   NOTA

2
    The eccentricity of a conic section is $\dfrac{3}{5}$. The distance between the focal points is

    24. Find the length of the minor axis of this conic section.
    A) 32   B)   40   C) 42
    D) 48   E)   NOTA

3   Find the area of an ellipse with the following equation:
    $9x^2 + 36y^2 - 54x - 360y = -657$
    A) 9π B) 18π C) 36π
    D) $324\pi \, 3$ E)   NOTA

4   What is the center, C, and the radius, r, of the circle $(x-4)^2 + (y+3)^2 = 7$
    A) $C(-4,3), r = 7$ B) $C(4,-3), r = 7$ C) $C(-4,3), r = \sqrt{7}$
    D) $C(4,-3), r = \sqrt{7}$ E)   NOTA

5   What is the area of the region enclosed by $4x^2 + y^2 = 36$?
    A) 9π B) 18π C) 36π
    D) 39π E)   NOTA

6   What are the coordinates of the focus of the parabola $y^2 - 6y - 4x + 13 = 0$
    A) (0,2)   B)   (2,0)   C) (3,2)
    D) (2,3)   E)   NOTA

7
    If $x = \dfrac{y+6}{x-1}$, for $x \neq 1$ then what is the vertex of the graph?
    A) (0,-6)   B)   (-6,0)   C) (3,2)
    D) (2,3)   E)   NOTA

8   The graph of $4x^2 - 16x - y^2 - 6y - 9 = 0$ is a(n)
    A) Parabola   B)   Hyperbola   C) Ellipse
    D) Circle   E)   NOTA

9   For what value of k will the graph of the equation $2x^2 + xy - 6y^2 + 7x - 7y = k$ form
    two intersection lines?
    A) -3   B)   0   C) 3
    D) 6   E)   NOTA

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10   $B(x)$ is the graph of all co-planar points for which the sum of the distances to the

points (1,3) and (1,5) is 6. The graph of $B(x)$ is a(n)

A) Line   B)   Ellipse   C) Parabola
D) Hyperbola   E)   NOTA

11   The locus of points in a plane equidistant from (-1, -4) and (5, 3) can be expressed
by an equation of fitting the form $Ax + By = C$, where $A,\ B$ and C are relatively
prime integers, and $A \geq 0$. What is $A + B + C$?

A) 24   B)   29   C) 31
D) 43   E)   NOTA

12   Which of the following represent a conic section?
I. $y = x^2 + 1$

II. $y = \dfrac{1}{x}$

III. $y = 3x^2 + x - 2y^2 + y + 7$

A) I only   B)   I and II only   C) I and III only
D) I, II and III   E)   NOTA

13   What is the exact area bounded by $x^2 - 6x + y^2 + 12y = -20$

A) 13   B)   25   C) 13π
D) 25π E)   NOTA

14   What is the conic represented by the following equation?
$0 = 6x^2 - 4xy + 8y^2 + 3x + 4y + 695$

A) Circle   B)   Ellipse   C) Hyperbola
D) Parabola   E)   NOTA

15   A parabola with equation $y = 0.25x^2 + 3x + 2$ contains points A and B. Wehre do
the lines tanget to A and B intersect the directrix if $\overline{AB}$ is the latus rectum?

A) (-6, -7)   B)   (-6, -8)   C) (-4, -6), (-8, -6)
D) (5,4)   E)   NOTA

16   For the conic $4x^2 + 9y^2 - 16x - 20 = 0$, find the sum of the x-coordinates of the foci
and the vertices on the major axis.

A) 0   B)   6   C) $4 + \sqrt{5}$
D) $8 + \sqrt{5}$ E)   NOTA

17 An arch in the form of a semi-ellipse is 48 ft. wide at the base and has a height of 20 ft. How wide (exactly) is the arch at a height of 10 feet above the base?

A) $6\sqrt{3}$ B) $12\sqrt{3}$ C) $18\sqrt{3}$

D) $24\sqrt{3}$ E) NOTA

18 What is the area of the circle with equation $x^2 + y^2 - 4y - 96 = 0$?

A) 9216π B) 100π C) 96π

D) 10π E) NOTA

19 The graph of the quadratic equation with equation $y = 2x^2 + 8x + C$ passes through the x-axis at the point (-1, 0). The graph also passes through the x-axis at the point (k, 0). Find the value of k.

A) 4   B) 1   C) -3

D) -5   E) NOTA

20 The maximum of $f(x) = -x^2 + 2x + q$ has a maximum value of 6 at $x = 1$. What if the value of $f(x)$?

A) 6   B) 5   C) -3

D) -2   E) NOTA

21 Determine the equation for the locus of points equidistant from the point (4,3) and the line $y = -1$ and lying in the same plane.

A) $y = \frac{1}{8}(x-4)^2 + 1$ B) $x = \frac{1}{8}(y-3)^2 + 4$ C) $y = 8(x-4)^2 + 1$

D) $y = \frac{1}{8}(x-3)^2 + 4$ E) NOTA

22 Which of the following is <u>not</u> a conic section?

A) Hyperbola   B) Point   C) Circle

D) 2 intersecting lines   E) NOTA

23 If the circle which passes through the points (1,1), (10,-2) and (2,-6) is written in standard form, find the sum of the coefficients for each x term with a nonzero exponent.

A) -10   B) -9   C) -8

D) -4   E) NOTA

24 Determine the area of the largest circle that can be inscribed within the area of the intersections of the following two circles:

Circle 1: $x^2 + y^2 + 6x - 8y + 16 = 0$

Circle 2: $x^2 + y^2 - 4x - 8y + 4 = 0$

A) $\dfrac{\pi}{4}$
B) π
C) $\dfrac{3\pi}{2}$
D) 4π
E) NOTA

25 Determine the eccentricity of the ellipse defined by the following equation:

$9x^2 + 4y^2 - 54x - 16y - 47 = 0$

A) $\dfrac{\sqrt{5}}{3}$
B) $\dfrac{\sqrt{13}}{3}$
C) $\dfrac{3}{2}$
D) $\dfrac{9}{2}$
E) NOTA

26

Each asymptote of the hyperbola $\dfrac{(x-3)^2}{9} - \dfrac{(y-2)^2}{4} = 1$ intersects the line

$3y + 7x = 8$ once. What is the sum of the abscissas of these two intersection point?

A) $\dfrac{4}{3}$
B) $\dfrac{4}{45}$
C) $\dfrac{4}{5}$
D) $\dfrac{68}{15}$
E) NOTA

27 Of the shortest distance from the latus rectum to the directrix of a parabola is 6, what is the length of the latus rectum?

A) 3
B) 6
C) 12
D) Cannot be determined
E) NOTA

28 What is area plus the circumference of the graph of $x^2 + y^2 + 28x - 34y + 469 = 0$?

A) 8π
B) 16π
C) 32π
D) 24π
E) NOTA

29. To graph a hyperbola, first you create a "rectangle" whose midpoints of sides are the vertices and co-vertices of the hyperbola. You then draw the lines which contains the diagonals of the "rectangle, and trace in the hyperbola. What is the area of the "rectangle" used in graphing
$8x^2 - 9y^2 + 32x + 54y - 121 = 0$?

A) $6\sqrt{2}$ B) 34   C) $24\sqrt{2}$
D) 72   E) NOTA

30. The focus of $y^2 - 17x - 6y - 25 = 0$ has coordinates (a, b). Find $\dfrac{\ln|ab|}{b^2}$ to the nearest hundredth.

A) -0.06   B) 0.21   C) 0.67
D) 1.04   E) NOTA

31. A parabola is defined in the Cartesian plane by a focus of $(9, 2)$ and a directrix with equation $9x + 6y = 80$. Determine the length of the latus rectum for the described conic section.

A) $\dfrac{\sqrt{13}}{2}$ B) $\dfrac{3\sqrt{13}}{2}$ C) $\dfrac{\sqrt{13}}{3}$
D) $\dfrac{2\sqrt{13}}{3}$ E) NOTA

32. A cartographer is placed in charge of mapping as much land as he can. He digs a well 10 miles away from his office. Each day he can ride his horse a total of 40 miles. How many square miles can he cover on horseback if he is to take a break for water half way through each excursion?

A) $50\pi\sqrt{3}$ B) $50\pi\sqrt{2}$ C) $\dfrac{50\pi}{3}\sqrt{3}$
D) $\dfrac{50\pi}{3}\sqrt{2}$ E) NOTA

33. Which of the following conics is incorrectly match with its possible degenerate?
A) Circle-point   B) Ellipse-line   C) Parabola – 2 lines
D) Hyperbola- 2 intersection lines   E) NOTA

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34 Give the eccentricity of $2x^2 - y^2 + 8x + 6y - 11 = 0$

A) $\sqrt{3}$ B) $\dfrac{\sqrt{6}}{2}$ C) $\sqrt{15}$

D) $\dfrac{\sqrt{2}}{2}$ E) NOTA

35 Which of the following represent equations of the asymptotes of the hyperbola given by $4x^2 - 3y^2 + 8x + 16 = 0$

A) $y = \pm \dfrac{2}{\sqrt{3}}(x-1)$ B) $y = \pm 3x - 1$ C) $y = \pm \dfrac{2}{\sqrt{3}}x$

D) $y = \pm 4x$ E) NOTA

36 Halley's comet has an elliptical orbit with an eccentricity of $e \approx 0.97$. The length of the major axis of the orbit is approximately 36.18 astronomical units. To the nearest million miles how close does Halley's comet come to the sun if the mean distance between earth and the sun is approximately 93 million miles?

A) 50 million   B) 45 million   C) 44 million
D) 47 million   E) NOTA

37 Which of the following is an equation of the parabola whose vertex is at $\left(\dfrac{5}{2}, -\dfrac{3}{4}\right)$

and whose graph passes through the point (-2, 4)?

A) $y = \left(x + \dfrac{5}{2}\right)^2 - \dfrac{3}{4}$ B) $y = \dfrac{3}{4}\left(x - \dfrac{5}{2}\right)^2$ C) $y = 19\left(x - \dfrac{5}{2}\right)^2 - \dfrac{3}{4}$

D) $y = \left(x - \dfrac{5}{2}\right)^2 - \dfrac{3}{4}$ E) NOTA

38 What is the eccentricity of $8x^2 - 16xy + 8y^2 + 5x - 2y = 2718281828$

A) 0   B) 1   C) 2
D) E E) NOTA

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Answers

1.	C
2.	A
3.	B
4.	D
5.	B
6.	D
7.	E (1/2,-25/4)
8.	B
9.	A
10.	12
11.	D
12.	C
13.	D
14.	B
15.	B
16.	E 8
17.	D
18.	B
19.	C
20.	B
21.	A
22.	E
23.	B
24.	B
25.	A
26.	B
27.	C
28.	D
29.	C
30.	B
31.	D
32.	A
33.	B
34.	A
35.	E $y = \pm \dfrac{2}{\sqrt{3}}(x+1)$
36.	A
37.	E $y = \dfrac{19}{18}\left(x - \dfrac{5}{2}\right)^2 - \dfrac{3}{4}$
38.	B

Solutions

1	$A = ab\pi, \quad a = \dfrac{3}{2}b, \quad a^2 = b^2 + c^2$ $64 = b\left(\dfrac{3}{2}b\right)\pi, \quad 64 = a\left(\dfrac{2}{3}a\right)\pi, \quad c^2 = \dfrac{96}{\pi} - \dfrac{128}{3\pi} = \dfrac{160}{3\pi}$ $b^2 = \dfrac{128}{3\pi}, \quad a^2 = \dfrac{96}{\pi}, \quad c = \dfrac{4\sqrt{30\pi}}{3\pi} \to 2c = \dfrac{8\sqrt{30\pi}}{3\pi} \approx 8.24$
2	$e = \dfrac{3}{5} = \dfrac{12}{a}, a = 20, \quad 20^2 = b^2 + 12^2, b^2 = 256, b = 16 \to 2b = 32$
9	Show that the product of two linear terms in 0. $(2x - 3y)(x + 2y)$; Then try to match up linear terms $2x^2 + xy - 6y^2 + 7x - 7y - k = (2x - 3y + 1)(x + 2y + 3) \to -k = 3 \to k = -3$