JAN 1994

1. Which conic is described by the equation $4x^2 + 4y^2 - x + y = 0$?

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

2. What is the length of the minor axis of the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$?

   A. 3 B. 4 C. 6 D. 8

3. A circle, with centre $(-2, 3)$ passes through the point $(5, -6)$. Determine the length of the radius to 1 decimal place.

   A. 7.6 B. 9.5 C. 11.4 D. 16.0

4. Determine the vertex of the parabola given by the equation $4x - 8 = y^2 + 4y$.

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

5. A point P moves such that it is always equidistant from 2 fixed points. Identify the locus.

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

6. A rectangular hyperbola with centre $(2, 1)$ has one vertex at $(2, 7)$. What is its equation?

   A. $\frac{(x-2)^2}{36} - \frac{(y-1)^2}{36} = 1$ B. $\frac{(x-2)^2}{36} - \frac{(y-1)^2}{36} = -1$

   C. $\frac{(x-2)^2}{49} - \frac{(y-1)^2}{49} = 1$ D. $\frac{(x-2)^2}{49} - \frac{(y-1)^2}{49} = -1$

7. Determine the measure of the acute angle formed by the intersection of the asymptotes of the hyperbola $\frac{x^2}{36} - \frac{y^2}{16} = 1$. (accurate to 1 decimal place)

   A. 47.9° B. 56.3° C. 66.7° D. 67.4°

JUN 1994

8. Determine the centre of the circle with a diameter whose endpoints are $(-2,\ 7)$ and $(-4,\ -5)$.

A. $(-3,\ 6)$ B. $(-3,\ 2)$ C. $(-3,\ 1)$ D. $(-1,\ 6)$

9. What are the slopes of the asymptotes of the hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$?

A. $\pm\frac{4}{9}$ B. $\pm\frac{9}{4}$ C. $\pm\frac{2}{3}$ D. $\pm\frac{3}{2}$

10. What is the equation of the line that contains the vertices of the hyperbola $\frac{(x-1)^2}{16} - \frac{(y+2)^2}{25} = 1$?

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

11. Every point on a conic is equidistant from the point $(5,\ -6)$ and the conic contains the point $(1,\ 9)$. Determine the equation of this conic.

A. $(x-5)^2 + (y+6)^2 = 241$ B. $(x+5)^2 + (y-6)^2 = 241$

C. $(x-5)^2 + (y+6)^2 = 25$ D. $(x+5)^2 + (y-6)^2 = 25$

12. If the lengths of the major and minor axes of an ellipse are $2a$ and $2b$ respectively, then the area of the ellipse is given by $A = \pi ab$. Determine the area of the ellipse $\frac{x^2}{16} + \frac{y^2}{36} = 1$, accurate to 1 decimal place.

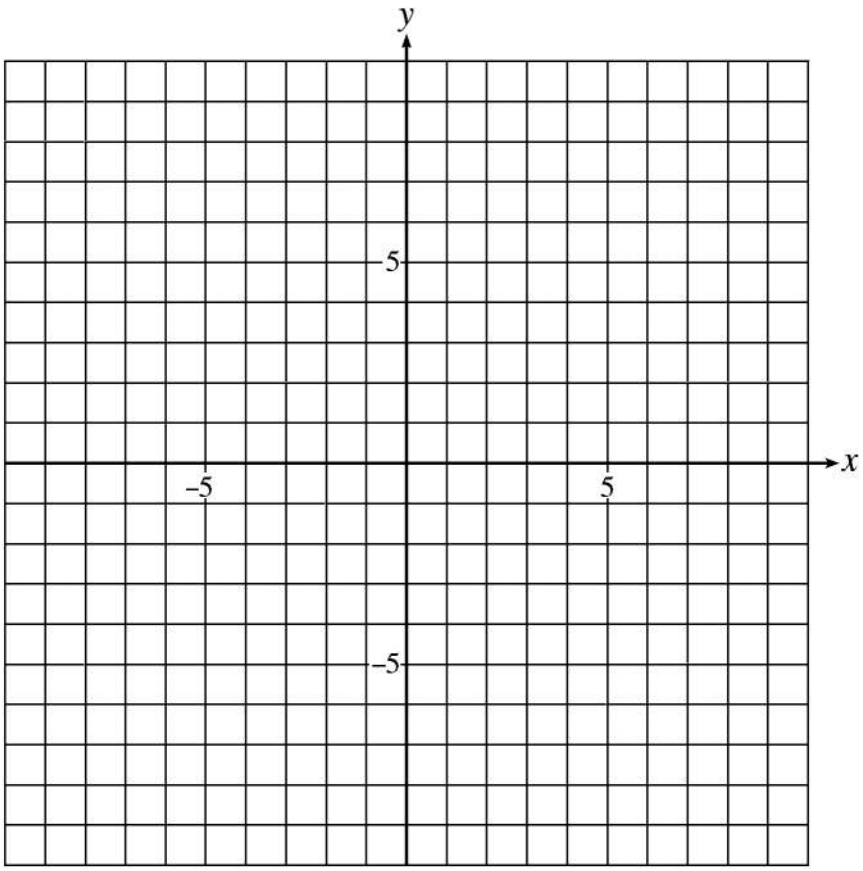
A. 75.4 B. 78.5 C. 150.8 D. 301.6

13. A circle with centre $(0,\ 0)$ is tangent to the line $x + y = 16$. Determine the equation of this circle.

A. $x^2 + y^2 = 32$ B. $x^2 + y^2 = 64$ C. $x^2 + y^2 = 128$ D. $x^2 + y^2 = 144$

14. Determine the value(s) of k for which the graph of the relation $(2+k)x^2 + (1-k^2)y^2 + x - 2y = 17$ represents a parabola.

15. Write in standard form and sketch a graph of the relation: $9x^2 + y^2 - 54x + 4y + 49 = 0$



JAN 1995

16. Determine the vertex of the parabola $x = -(y-2)^2 - 3$.

A. $(-3, 2)$ B. $(-2, 3)$ C. $(2, -3)$ D. $(3, -2)$

17. Determine the vertices of $\frac{(x+2)^2}{4} - \frac{(y-1)^2}{9} = -1$.

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

18. A point $P(x, y)$ moves such that it is always the same distance from the point $F(0, 2)$ as it is from the line defined by $y = -2$. Identify the locus.

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

19. Write $9x^2 + y^2 + 36x - 9 = 0$ in standard form.

A. $\dfrac{(x+2)^2}{\frac{13}{9}} + \dfrac{y^2}{13} = 1$

B. $\dfrac{(x+2)^2}{3} + \dfrac{y)^2}{27} = -1$

C. $\dfrac{(x+2)^2}{5} + \dfrac{y^2}{45} = 1$

D. $\dfrac{(x+2)^2}{9} + \dfrac{y^2}{27} = -1$

20. Determine the distance between the vertices of the hyperbola $xy = 6$.

A. $2\sqrt{6}$ B. $4\sqrt{6}$ C. $2\sqrt{3}$ D. $4\sqrt{3}$

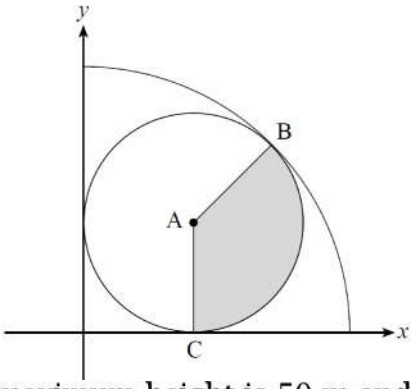
21. A circle with centre A is inscribed in the quadrant I sector of the circle $x^2 + y^2 = 64$. The inscribed circle has an area of 34.50 units^2. B and C are points of tangency. Determine the area of the shaded region. (Accurate to 2 decimal places.)

A. 10.35 units^2

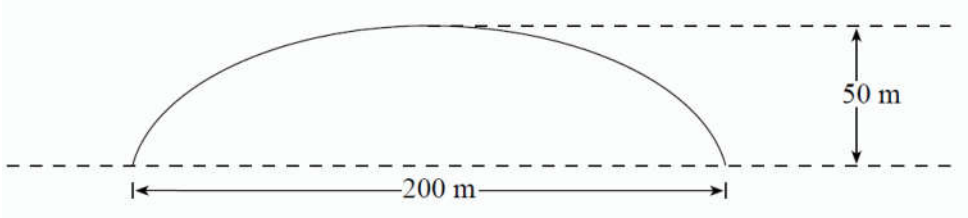
B. 11.50 units^2

C. 12.94 units^2

D. 14.78 units^2



22. A sports stadium has a semi-elliptical dome for its roof. If its maximum height is 50 m and its span is 200 m, how high is the dome at a point 72 m from the centre? (Accurate to 1 decimal place.)



APR 1995

23. At what point(s) will the graph of $x^2 - y^2 = 16$ intersect the graph of $x^2 + 4x + y^2 = 0$?

A. $(-4, 0)$

B. $(-4, 0)$, $(4, 0)$

C. $(-4, 0)$, $(4, 0)$, $(2, 2\sqrt{3})$

D. $(-4, 0)$, $(4, 0)$, $(2, 2\sqrt{3})$, $(2, -2\sqrt{3})$

24. Determine an equation for the ellipse that has vertices at $(2, 2)$ and $(-10, 2)$ and is tangent to the line $y = 5$.

A. $\frac{(x+4)^2}{36} + (y-2)^2 = 1$

B. $\frac{(x+4)^2}{36} + \frac{(y-2)^2}{9} = 1$

C. $\frac{(x-2)^2}{9} + \frac{(y+4)^2}{36} = 1$

D. $(x-2)^2 + \frac{(y+4)^2}{36} = 1$

25. Determine the number of points of intersection of $y = ax^2 + b$ and $y = 5x^2$, if $a > 5$ and $b < 0$.

A. 0 B. 1 C. 2 D. 4

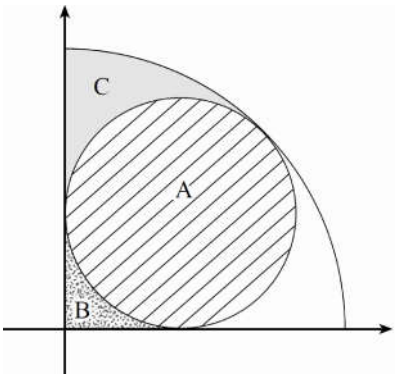
26. A circle is inscribed in the quadrant I sector of the circle $x^2 + y^2 = 36$. If A and B represent the areas of the indicated regions, determine an expression for the area of C

A. $\frac{9\pi - A - B}{2}$ units^2

B. $9\pi - A - B$ units^2

C. $\frac{36\pi - A - B}{2}$ units^2

D. $36\pi - A - B$ units^2



JUN 1995

27. Give the vertex of the parabola $x = (y+3)^2 - 4$.

A. $(-4, -3)$ B. $(-4, 3)$ C. $(4, -3)$ D. $(4, 3)$

28. Determine the radius of the circle $x^2 + y^2 + 10y + 9 = 0$.

A. 3 B. 4 C. $\sqrt{14}$ D. $\sqrt{34}$

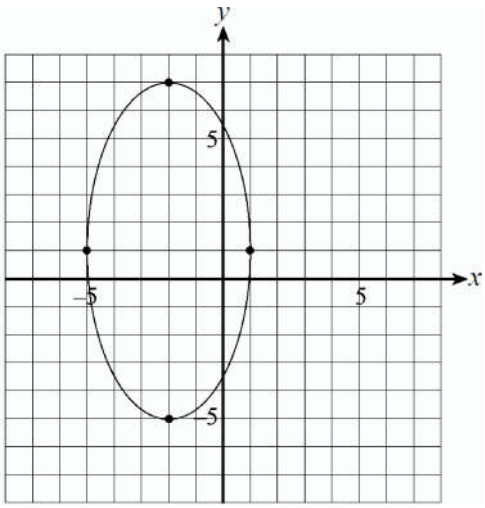
29. Determine the equation of the ellipse graphed below.

A. $\frac{(x-2)^2}{36}+\frac{(y+1)^2}{9}=1$

B. $\frac{(x-2)^2}{9}+\frac{(y-1)^2}{36}=1$

C. $\frac{(x+2)^2}{36}+\frac{(y-1)^2}{9}=1$

D. $\frac{(x+2)^2}{9}+\frac{(y-1)^2}{36}=1$



30. Determine an equation of the parabola with the vertex $(-2,\ -6)$ that opens up and contains the point $(0,\ -3)$

A. $y=-\frac{9}{4}(x+2)^2+6$ B. $y=(x+2)^2-3$ C. $y=(x+2)^2-6$ D. $y=\frac{3}{4}(x+2)^2-6$

31. A point $P\ (x,\ y)$ moves such that it is always equidistant from the point $(2,\ 3)$ and the line $x=-4$. Which equation represents this locus?

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

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

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

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

32. A rectangular hyperbola has centre $(0,\ 0)$ and vertices on the y-axis. If $(5,\ 7)$ and $(10,\ k)$ are points on the graph of the hyperbola, etermine a value of k. (Accurate to 2 decimal places.)

A. 5.83 B. 8.72 C. 11.14 D. 26.00

33. The transverse axis of a hyperbola has endpoints $(-2,\ 2)$ and $(10,\ 2)$. If one of the asymptotes has a slope of $\frac{2}{3}$, determine an equation of this hyperbola.

A. $\frac{(x-4)^2}{36}-\frac{(y-2)^2}{16}=1$

B. $\frac{(x-4)^2}{16}-\frac{(y-2)^2}{36}=1$

C. $\frac{(x+4)^2}{36}-\frac{(y+2)^2}{16}=1$

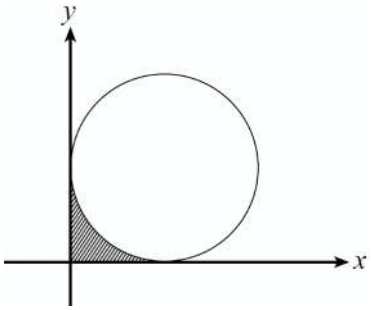
D. $\frac{(x+4)^2}{16}-\frac{(y+2)^2}{36}=1$

34. A hyperbola and a parabola both have $x = 0$ as an axis of symmetry. If (m, n) is one intersection point of these two curves, then which other point **must** also be an intersection point?

A. (n, m) B. $(m, -n)$ C. $(-m, n)$ D. $(-m, -n)$

35. Determine the area of the shaded region below if the equation of the circle is $(x-7)^2 + (y-7)^2 = 49$. (Accurate to 2 decimal places.)

A. 10.52
B. 11.46
C. 27.97
D. 38.00



AUG 1995

36. Determine an equation for the set of all points which are 3 times as far from the point $(0, 5)$ as they are from the point $(-1, 2)$.

A. $3\sqrt{x^2 + (y+5)^2} = \sqrt{(x-1)^2 + (y+2)^2}$ B. $3\sqrt{x^2 + (y-5)^2} = \sqrt{(x+1)^2 + (y-2)^2}$

C. $\sqrt{x^2 + (y+5)^2} = 3\sqrt{(x-1)^2 + (y+2)^2}$ D. $\sqrt{x^2 + (y-5)^2} = 3\sqrt{(x+1)^2 + (y-2)^2}$

37. A bridge over a river is supported by a parabolic arch which is 100 m wide at its base. If the maximum height of the arch is 10 m, determine which equation could represent the arch.

A. $y = -0.2x^2$ B. $y = -0.1x^2$ C. $y = -0.001x^2$ D. $y = -0.004x^2$

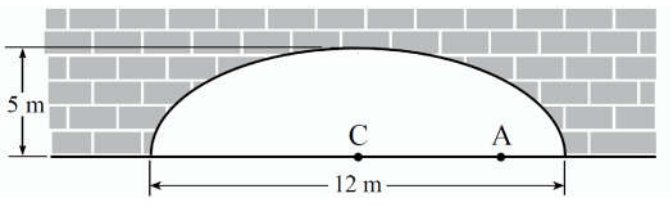
JAN 1996

38. Identify the conic which is described by $9x^2 - 9y^2 - 18y - 45 = 0$.

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

39. A tunnel is semi-elliptical in shape, with a maximum height of 5 m and a maximum width of 12 m. Determine the height of the tunnel at point A which is 4 m from the centre of C.

A. 1.67 m
B. 3.33 m
C. 3.73 m
D. 4.71 m



40. A point P moves such that it is always the same distance from the point $(4,\ 4)$ as it is from the line $x = 2$. Find an equation of the locus.

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

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

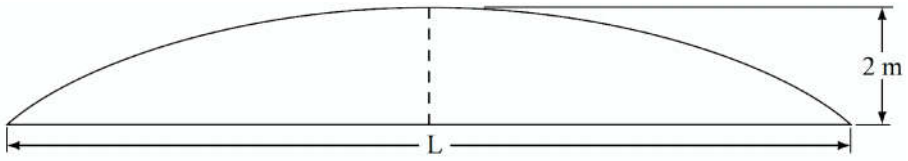
41. Determine the equations of the asymptotes of the hyperbola defined by $\frac{x^2}{16}-\frac{(y+2)^2}{25}=1$.

A. $\pm\frac{4}{5}x+2$ B. $\pm\frac{4}{5}x-2$ C. $\pm\frac{5}{4}x+2$ D. $\pm\frac{5}{4}x-2$

42. All the points on a line are equidistant from the points $P(x_1, y_1)$, and $Q(x_2, y_2)$. Determine the slope of this line.

A. $-\frac{x_2-x_1}{y_2-y_1}$ B. $-\frac{y_2-y_1}{x_2-x_1}$ C. $\frac{x_2-x_1}{y_2-y_1}$ D. $\frac{y_2-y_1}{x_2-x_1}$

43. A circular arch of a footbridge rises 2 m at the centre. If the horizontal length L of the footbridge is the same as the radius of the circle, calculate the value of L. (Accurate to at least two decimal places.)



APR 1996

44. An ellipse is defined by $8x^2+4y^2=p$, and its major axis is 6 units long. Find the value of p.

A. 12 B. 24 C. 36 D. 72

JUN 1996

45. Determine the centre of the circle that has $(-8,\ 5)$ and $(6,\ -1)$ as the endpoints of a diameter.

A. $(-7,\ 3)$ B. $(-2,\ 4)$ C. $(-1,\ 2)$ D. $(7,\ -3)$

46. What is the vertex of the parabola $x = -2(y-8)^2 + 5$?

A. $(-5, -8)$ B. $(-5, 8)$ C. $(5, -8)$ D. $(5, 8)$

47. Determine the slopes of the asymptotes of the hyperbola $\frac{x^2}{36} - \frac{y^2}{100} = 1$.

A. $\pm\frac{3}{5}$ B. $\pm\frac{9}{25}$ C. $\pm\frac{5}{3}$ D. $\pm\frac{25}{9}$

48. Change to standard form: $2x^2 - 3y^2 - 12x - 6 = 0$

A. $\frac{(x-3)^2}{12} - \frac{y^2}{8} = 1$ B. $\frac{(x-3)^2}{\frac{15}{2}} - \frac{y^2}{5} = 1$

C. $\frac{(x-3)^2}{6} - \frac{y^2}{4} = -1$ D. $\frac{(x-6)^2}{21} - \frac{y^2}{14} = 1$

49. A point $P(x, y)$ moves in a path that is parallel to the graph of the relation $8x - 4y = 7$ and passes through $(-3, 5)$. Determine an equation of this locus.

A. $y = 2x + 11$ B. $y = 2x - 11$ C. $y = -2x + 11$ D. $y = -2x - 11$

50. A circle with centre $(2, k)$ is tangent to the lines $x = -4$ and $y = 2$. Determine all possible values of k.

A. $k = -4$ or 8 B. $k = -4$ or 6 C. $k = -6$ or 8 D. $k = 6$ or 8

51. Determine the shortest distance from the point $(8, 6)$ to the circle $x^2 + y^2 = 5$. (Accurate to two decimal places.)

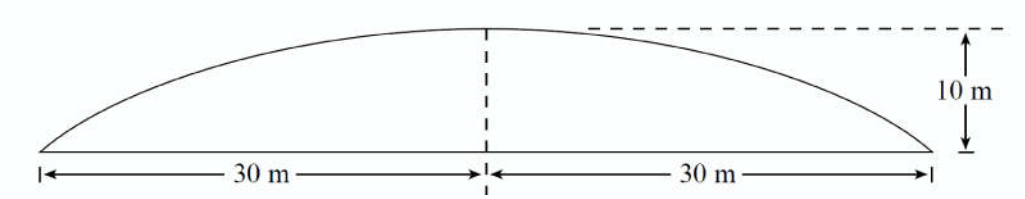
A. 5.00 B. 7.76 C. 8.32 D. 8.66

AUG 1996

52. Determine all values of the constant k such that the following hyperbola will have a horizontal transverse axis. $2x^2 - 3y^2 + 18y - k = 0$

A. $k < -27$ B. $k > -27$ C. $k < 27$ D. $k > 27$

53. A circular arch of a footbridge spans a horizontal distance of 60 m and rises 10 m in the centre. Determine the radius of the circle.



A. 30 m B. 40 m C. 50 m D. 60 m

54. A rock is kicked off a vertical cliff and falls in a parabolic path to the water below. The cliff is 50 m high and the rock hits the water 20 m from the base of the cliff. What is the horizontal distance of the rock from the cliff face when the rock is at a height of 10 m above the water? (Accurate to at least 2 decimal places.)

JAN 1997

55. Determine an equation of the circle with centre $(3, -2)$ and radius 4.

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

C. $(x+3)^2+(y-2)^2=16$ D. $(x-3)^2+(y+2)^2=16$

56. Which conic is represented by the equation $4x^2-4y^2+8x-24y-9=0$?

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

57. Determine an equation of a rectangular hyperbola with centre at $(-2, 0)$ and one vertex at $(4, 0)$.

A. $(x-2)^2-y^2=16$ B. $(x+2)^2-y^2=16$ C. $(x-2)^2-y^2=36$ D. $(x+2)^2-y^2=36$

58. Change the following equation to standard form. $2x^2+y^2-12x-10=0$

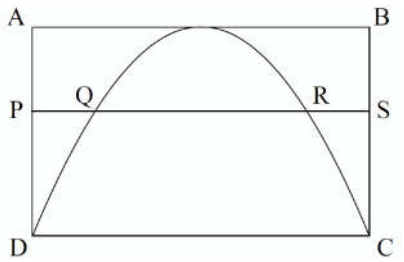
A. $\frac{(x+3)^2}{4}+\frac{y^2}{8}=1$ B. $\frac{(x-3)^2}{4}+\frac{y^2}{8}=1$ C. $\frac{(x+3)^2}{14}+\frac{y^2}{28}=1$ D. $\frac{(x-3)^2}{14}+\frac{y^2}{28}=1$

59. Determine the value of k ($k > 0$) so that the conjugate axis of the hyperbola $x^2 - \frac{y^2}{k} = 1$ is 2 units longer than the minor axis of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$.

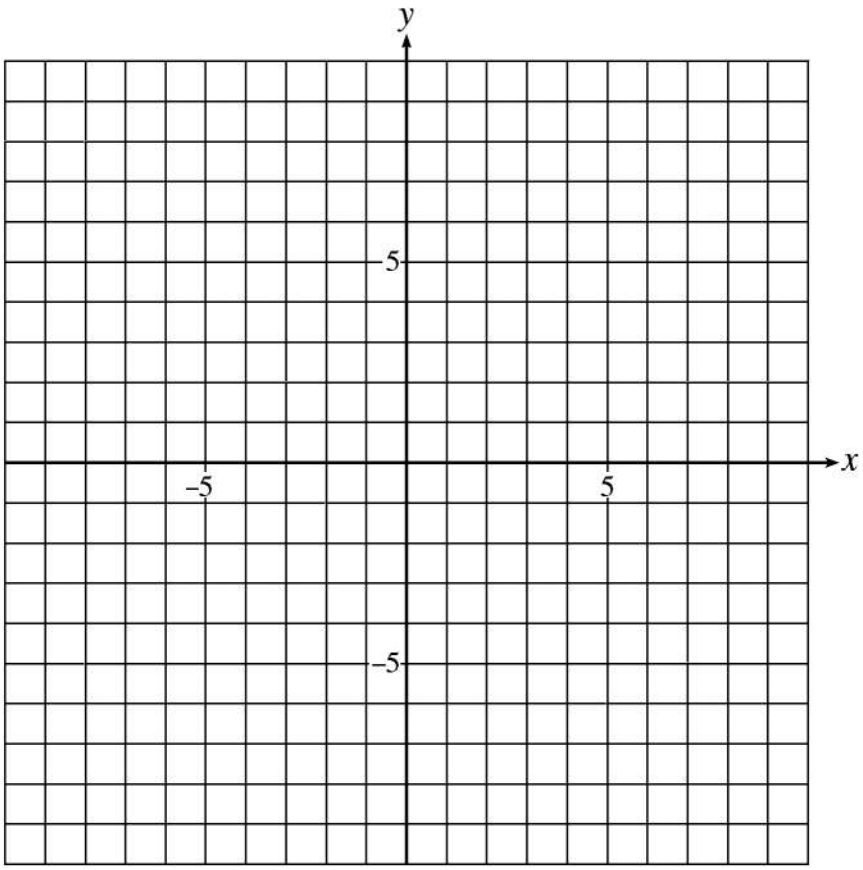
A. 8 B. 10 C. 16 D. 25

60. A parabola is drawn within rectangle $ABCD$ with its vertex at the midpoint AB. PS is parallel to AB. If $AB = 80$, $BC = 60$, and $AP = 20$, determine the length of QR. (Accurate to one decimal place.)

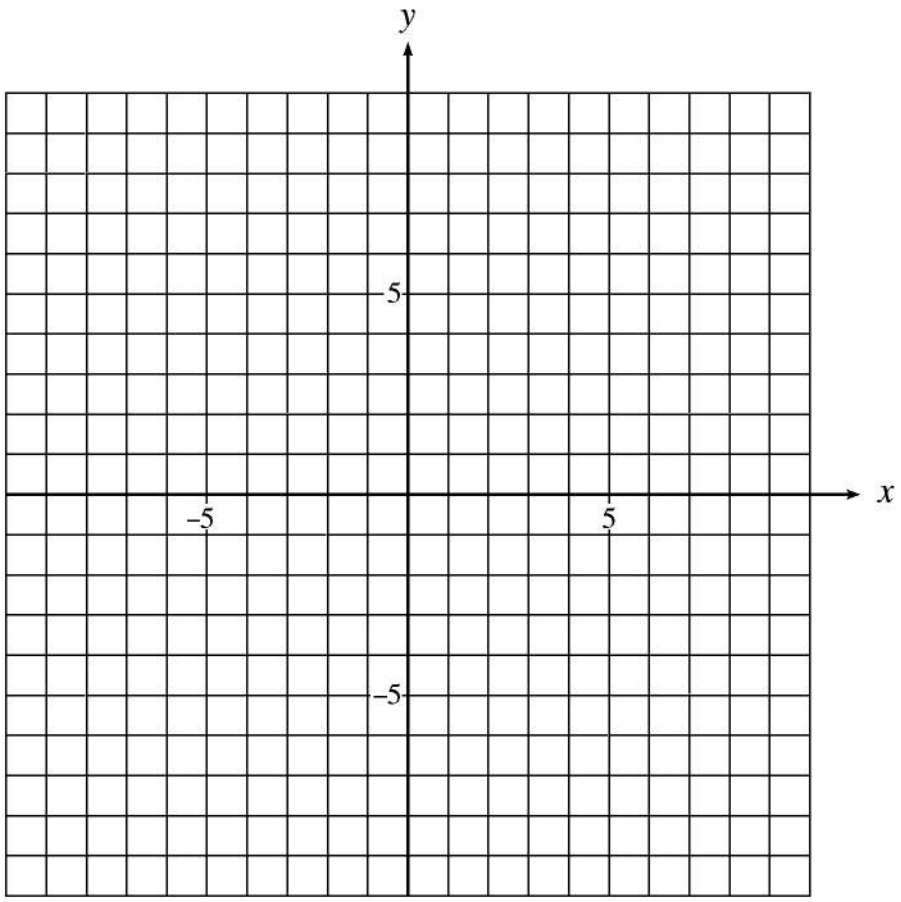
A. 45.6
B. 46.2
C. 48.3
D. 49.7



61. A point P moves such that it is always equidistant from the point F (2, 5) and the line given by $y = 1$. Find an equation of this locus in standard form, and graph the relation on the grid below.



62. A function is defined by the equation $f(t) = t^2 + 6t + 7$. Sketch the graph of $f(x) + f(y) = 0$.



APR 1997

63. Which statement below best describes the graph of $x^2 - y^2 = 0$?

A. no graph exists
B. a single line
C. a single point
D. two intersecting lines

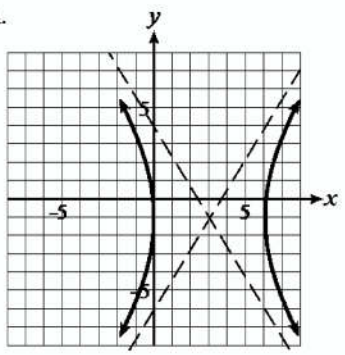
JUN 1997

64. Which conic is represented by the equation $4x^2 - 2y^2 - x + y - 7 = 0$?

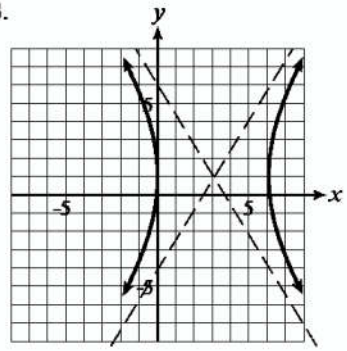
A. circle
B. ellipse
C. parabola
D. hyperbola

65. Which graph best illustrates $\frac{(x-3)^2}{9} - \frac{(y+1)^2}{25} = 1$?

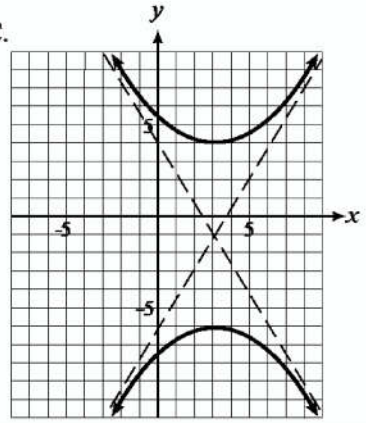
A.



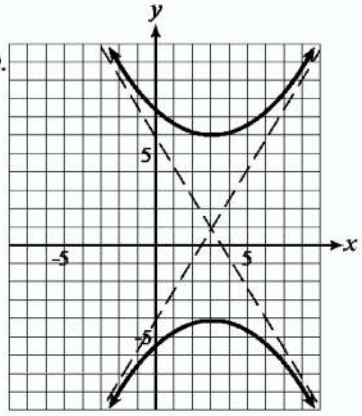
B.



C.



D.



66. Determine the range of $\frac{(x-3)^2}{16} + \frac{(y+2)^2}{25} = 1$.

A. $-7 \le y \le 3$ B. $-3 \le y \le 7$ C. $-7 \le x \le 1$ D. $-1 \le x \le 7$

67. Determine an equation of the line tangent to the circle $(x-5)^2 + (y+12)^2 = 169$ at the point $(0,\ 0)$

A. $y = \frac{5}{12}x$ B. $y = \frac{12}{5}x$ C. $y = -\frac{5}{12}x$ D. $y = -\frac{12}{5}x$

68. The cross-section of a drainage canal is semi-elliptical in shape, measuring 30 m across and 8 m deep at its deepest point. If the depth of water in the canal is 3 m, determine the width of the water surface.