

G.GPE.A.3: Equations of Conics

- 1 What is the graph of the function $y = \sqrt{4-x^2}$?
 - 1) a circle whose radius is 2 and whose center is at the origin
 - 2) a circle whose radius is 4 and whose center is at the origin
 - 3) the upper half of a circle whose radius is 2 and whose center is at the origin
 - 4) the upper half of a circle whose radius is 4 and whose center is at the origin
- 2 What is the axis of symmetry of the graph of the equation $x = y^2$?
 - 1) x -axis
 - 2) y -axis
 - 3) line $y = x$
 - 4) line $y = -x$
- 3 The graph of the equation $x^2 + y^2 = r^2$ forms
 - 1) a circle
 - 2) a parabola
 - 3) a straight line
 - 4) two intersecting lines
- 4 The graph of the equation $x^2 + y^2 = 4$ can be described as a
 - 1) line passing through points $(0,2)$ and $(2,0)$
 - 2) parabola with its vertex at $(0,2)$
 - 3) circle with its center at the origin and a radius of 2
 - 4) circle with its center at the origin and a radius of 4
- 5 When graphed on the coordinate plane, the equations $y = 2x^2 + 4x + 5$ and $x^2 + y^2 = 36$ form
 - 1) a parabola and a straight line
 - 2) a parabola and a circle
 - 3) two parabolas
 - 4) two circles
- 6 The graph of the equation $2x^2 - 3y^2 = 4$ forms
 - 1) a circle
 - 2) an ellipse
 - 3) a hyperbola
 - 4) a parabola
- 7 An object orbiting a planet travels in a path represented by the equation $3(y+1)^2 + 5(x+4)^2 = 15$. In which type of pattern does the object travel?
 - 1) hyperbola
 - 2) ellipse
 - 3) circle
 - 4) parabola
- 8 A commercial artist plans to include an ellipse in a design and wants the length of the horizontal axis to equal 10 and the length of the vertical axis to equal 6. Which equation could represent this ellipse?
 - 1) $9x^2 + 25y^2 = 225$
 - 2) $9x^2 - 25y^2 = 225$
 - 3) $x^2 + y^2 = 100$
 - 4) $3y = 20x^2$
- 9 Which equation, when graphed on a Cartesian coordinate plane, would best represent an elliptical racetrack?
 - 1) $3x^2 + 10y^2 = 288,000$
 - 2) $3x^2 - 10y^2 = 288,000$
 - 3) $3x + 10y = 288,000$
 - 4) $30xy = 288,000$

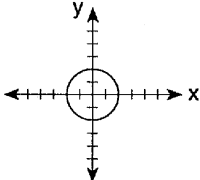
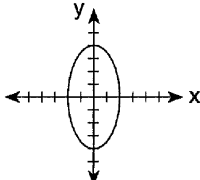
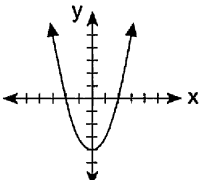
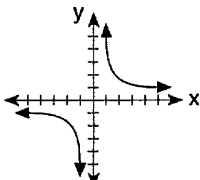
10 A designer who is planning to install an elliptical mirror is laying out the design on a coordinate grid. Which equation could represent the elliptical mirror?

- 1) $x^2 = 144 + 36y^2$
- 2) $x^2 + y^2 = 144$
- 3) $x^2 + 4y^2 = 144$
- 4) $y = 4y^2 + 144$

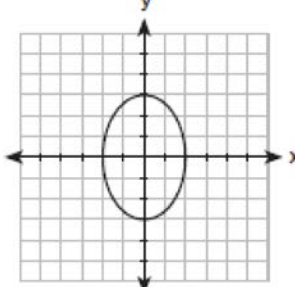
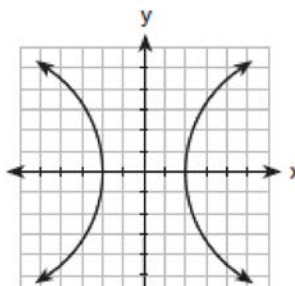
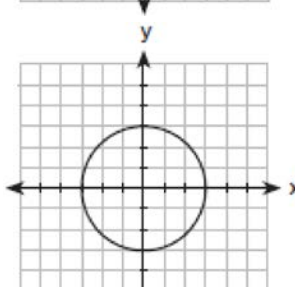
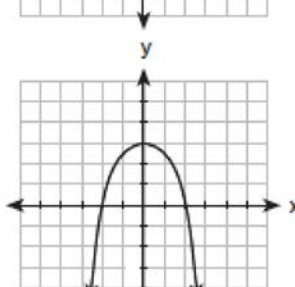
11 Which equation represents an ellipse?

- 1) $3x^2 = 4 - 5y^2$
- 2) $4x^2 = 9 - 4y$
- 3) $6x^2 = 9 + 8y^2$
- 4) $xy = 12$

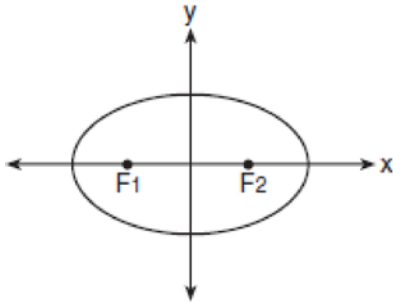
12 Which graph represents the equation $\frac{x^2}{4} + \frac{y^2}{4} = 1$?

- 1) 
- 2) 
- 3) 
- 4) 

13 Which graph represents the equation $9x^2 = 36 - 4y^2$?

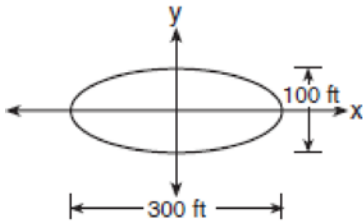
- 1) 
- 2) 
- 3) 
- 4) 

- 14 The accompanying diagram shows the elliptical orbit of a planet. The foci of the elliptical orbit are F_1 and F_2 .



If a , b , and c are all positive and $a \neq b \neq c$, which equation could represent the path of the planet?

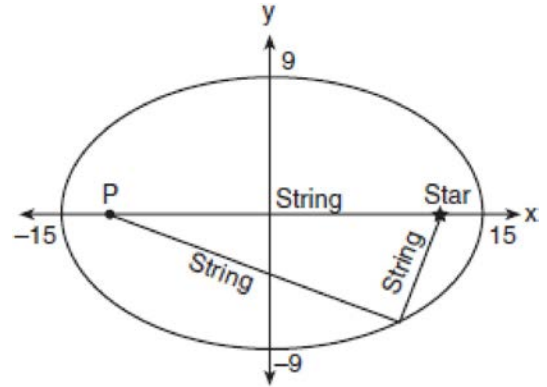
- 1) $ax^2 - by^2 = c^2$
 - 2) $ax^2 + by^2 = c^2$
 - 3) $y = ax^2 + c^2$
 - 4) $x^2 + y^2 = c^2$
- 15 The accompanying diagram represents the elliptical path of a ride at an amusement park.



Which equation represents this path?

- 1) $x^2 + y^2 = 300$
- 2) $y = x^2 + 100x + 300$
- 3) $\frac{x^2}{150^2} + \frac{y^2}{50^2} = 1$
- 4) $\frac{x^2}{150^2} - \frac{y^2}{50^2} = 1$

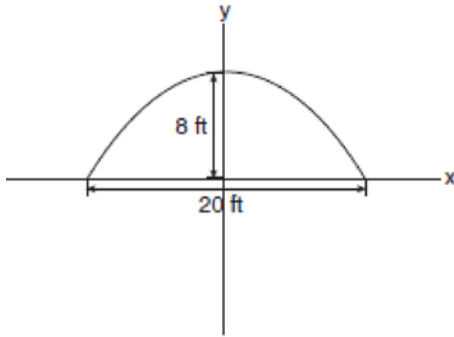
- 16 The accompanying diagram shows the construction of a model of an elliptical orbit of a planet traveling around a star. Point P and the center of the star represent the foci of the orbit.



Which equation could represent the relation shown?

- 1) $\frac{x^2}{81} + \frac{y^2}{225} = 1$
- 2) $\frac{x^2}{225} + \frac{y^2}{81} = 1$
- 3) $\frac{x^2}{15} + \frac{y^2}{9} = 1$
- 4) $\frac{x^2}{15} - \frac{y^2}{9} = 1$

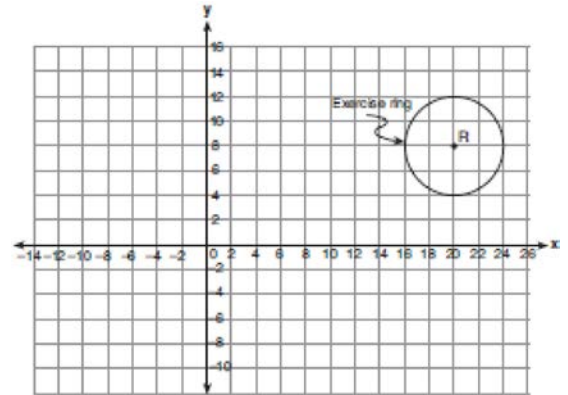
- 17 An architect is designing a building to include an arch in the shape of a semi-ellipse (half an ellipse), such that the width of the arch is 20 feet and the height of the arch is 8 feet, as shown in the accompanying diagram.



Which equation models this arch?

- 1) $\frac{x^2}{100} + \frac{y^2}{64} = 1$
- 2) $\frac{x^2}{400} + \frac{y^2}{64} = 1$
- 3) $\frac{x^2}{64} + \frac{y^2}{100} = 1$
- 4) $\frac{x^2}{64} + \frac{y^2}{400} = 1$

- 18 A landscape architect is working on the plans for a new horse farm. He is laying out the exercise ring and racetrack on the accompanying graph. The location of the circular exercise ring, with point R as its center, has already been plotted.



Write an equation that represents the outside edge of the exercise ring. The equation of the outside edge of the racetrack is $\frac{x^2}{144} + \frac{y^2}{36} = 1$. Sketch the outside edge of the racetrack on the graph.

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Answer Section

1 ANS: 3 REF: 080804b

2 ANS: 1

If you take the square root of both sides of the equation, it becomes $\pm \sqrt{x} = y$. A square root function and its reflection are symmetric about the x -axis.

REF: 010419b

3 ANS: 1 REF: 010714a

4 ANS: 3 REF: 080528a

5 ANS: 2 REF: 080723a

6 ANS: 3 REF: 080920b

7 ANS: 2

$$3(y+1)^2 + 5(x+4)^2 = 15$$

$$\frac{(x+4)^2}{3} + \frac{(y+1)^2}{5} = 1$$

REF: 080517b

8 ANS: 1

The length of the semi-major axis is half of 10, or 5. So $a^2 = 5^2 = 25$. The length of the semi-minor axis is half

$$9x^2 + 25y^2 = 225$$

of 6, or 3. So $b^2 = 3^2 = 9$.

$$\frac{x^2}{25} + \frac{y^2}{9} = 1$$

REF: 080318b

9 ANS: 1

$$3x^2 + 10y^2 = 288,000$$

$$\frac{x^2}{96,000} + \frac{y^2}{28,800} = 1$$

REF: 060512b

10 ANS: 3

$$x^2 + 4y^2 = 144$$

$$\frac{x^2}{144} + \frac{y^2}{36} = 1$$

REF: 080609b

11 ANS: 1 REF: 061020b

12 ANS: 1 REF: 019724siii

13 ANS: 1 REF: 010917b

14 ANS: 2 REF: 010410b

15 ANS: 3

The length of the semi-major axis is half of 300, or 150. The length of the semi-minor axis is half of 100, or 50.

REF: 060311b

16 ANS: 2

The length of the semi-major axis is 15. So $a^2 = 15^2 = 225$. The length of the semi-minor axis is 9. So $b^2 = 9^2 = 81$.

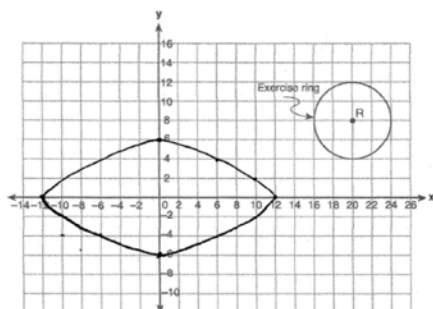
REF: 010517b

17 ANS: 1

The length of the semi-major axis is half of 20, or 10. So $a^2 = 10^2 = 100$. The length of the semi-minor axis is 8. So $b^2 = 8^2 = 64$.

REF: 080206b

18 ANS:



$$(x - 20)^2 + (y - 8)^2 = 16$$

. The center of the circle is (20,8) and the radius is 4. Since $a^2 = 144$, the length of the semi-major axis is 12. Since $b^2 = 36$, the length of the semi-minor axis is 6.

REF: 060730b