

# CHAPTER 10-4

## EQUATIONS OF ELLIPSES

1. 080517b

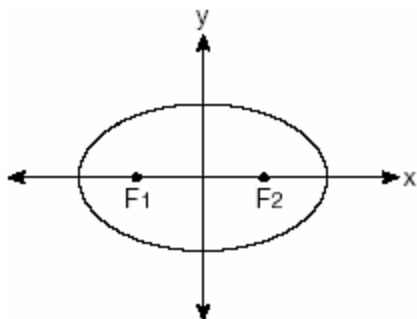
An object orbiting a planet travels in a path represented by the equation

$3(y+1)^2 + 5(x+4)^2 = 15$ . In which type of pattern does the object travel?

- [A] ellipse [B] parabola  
[C] hyperbola [D] circle

2. 010410b

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?

- [A]  $ax^2 - by^2 = c^2$  [B]  $ax^2 + by^2 = c^2$   
[C]  $x^2 + y^2 = c^2$  [D]  $y = ax^2 + c^2$

3. 060512b

Which equation, when graphed on a Cartesian coordinate plane, would best represent an elliptical racetrack?

- [A]  $3x + 10y = 288,000$   
[B]  $3x^2 - 10y^2 = 288,000$   
[C]  $3x^2 + 10y^2 = 288,000$   
[D]  $30xy = 288,000$

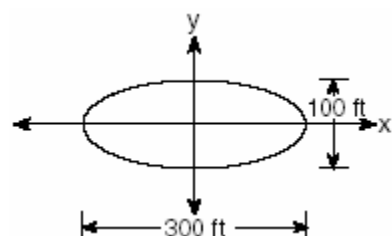
4. 080609b

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?

- [A]  $x^2 + 4y^2 = 144$  [B]  $y = 4y^2 + 144$   
[C]  $x^2 = 144 + 36y^2$  [D]  $x^2 + y^2 = 144$

5. 060311b

The accompanying diagram represents the elliptical path of a ride at an amusement park.



Which equation represents this path?

- [A]  $y = x^2 + 100x + 300$   
[B]  $\frac{x^2}{150^2} - \frac{y^2}{50^2} = 1$   
[C]  $x^2 + y^2 = 300$  [D]  $\frac{x^2}{150^2} + \frac{y^2}{50^2} = 1$

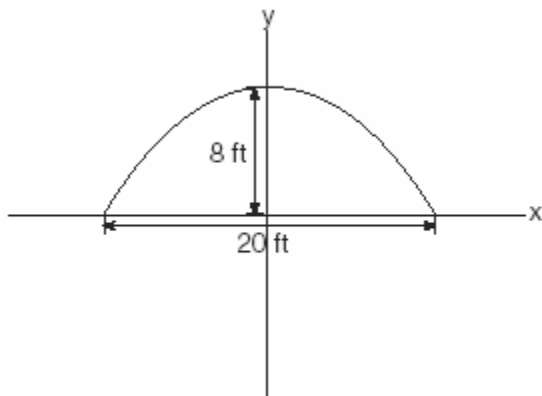
6. 080318b

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?

- [A]  $9x^2 - 25y^2 = 225$   
[B]  $9x^2 + 25y^2 = 225$   
[C]  $3y = 20x^2$  [D]  $x^2 + y^2 = 100$

7. 080206b

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.

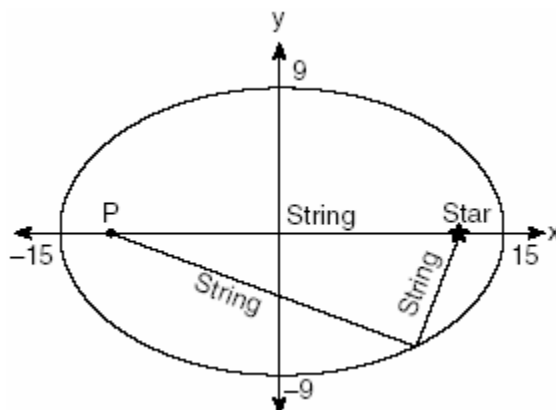


Which equation models this arch?

- [A]  $\frac{x^2}{64} + \frac{y^2}{400} = 1$       [B]  $\frac{x^2}{100} + \frac{y^2}{64} = 1$   
[C]  $\frac{x^2}{64} + \frac{y^2}{100} = 1$       [D]  $\frac{x^2}{400} + \frac{y^2}{64} = 1$

8. 010517b

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.

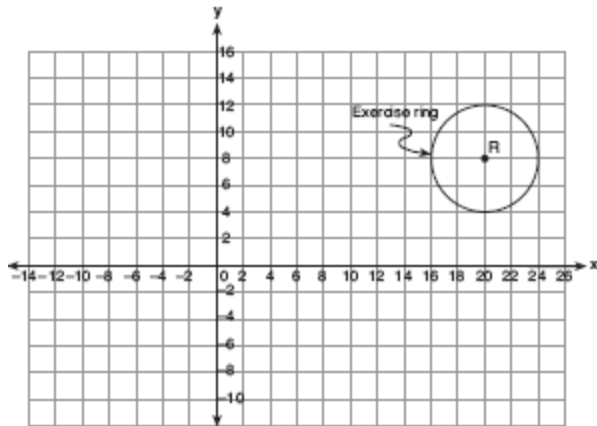


Which equation could represent the relation shown?

- [A]  $\frac{x^2}{15} - \frac{y^2}{9} = 1$       [B]  $\frac{x^2}{225} + \frac{y^2}{81} = 1$   
[C]  $\frac{x^2}{15} + \frac{y^2}{9} = 1$       [D]  $\frac{x^2}{81} + \frac{y^2}{225} = 1$

9. 060730b

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.

### **SOLVING NONLINEAR SYSTEMS**

10. 060627b

Solve the following system of equations algebraically:

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

$$3x - y = 3$$

[1] A

[2] B

[3] C

[4] A

[5] D

[6] B

[7] B

[8] B

[4]  $(x - 20)^2 + (y - 8)^2 = 16$  and the ellipse is sketched correctly.

[3] Appropriate work is shown, but one computational or graphing error is made.

[2] Appropriate work is shown, but two or more computational or graphing errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The equation of the circle is written correctly or the ellipse is sketched correctly, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[9] incorrect procedure.

[4] (0,-3) and (1,0) or an equivalent answer, and appropriate algebraic work is shown.

[3] Appropriate work is shown, but one computational error is made.

or [3] Appropriate work is shown, but only one correct solution is found or only the  $x$ - or the  $y$ -values are found correctly.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] (0,-3) and (1,0), but a method other than an algebraic solution is used.

or [2] A correct quadratic equation is written in standard form, such as  $18x^2 - 18x = 0$ , but no further correct work is shown.

or [2] An incorrect quadratic equation of equal difficulty is solved appropriately.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.

or [1]  $y = 3x - 3$  is found and substituted into the second equation, but no further correct work is shown.

or [1] (0,-3) and (1,0), but no work is shown.

[0] Only one correct solution is found or only the  $x$ - or the  $y$ -values are found correctly, and no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[10] obviously incorrect procedure.