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**Course:** CA&T Internet (70263)  
 Galarneau

**Assignment:** 10.3 The Ellipse

1. Complete the following statement.

An ellipse is the set of all points in the plane, the \_\_\_\_\_ of whose distances from two fixed points is a constant.

An ellipse is the set of all points in the plane, the sum of whose distances from two fixed points is a constant.

2. Complete the following statement.

The standard equation of an ellipse with center  $(0,0)$ , vertices  $(\pm a,0)$ , and foci  $(\pm c,0)$  is  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , where  $b^2 = \underline{\hspace{1cm}}$ .

The standard equation of an ellipse with center  $(0,0)$ , vertices  $(\pm a,0)$ , and foci  $(\pm c,0)$  is  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , where  $b^2 = a^2 - c^2$ .

3. The ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  lies inside the box formed by the four lines  $x = \pm a$ ,  $y = \pm b$ . State whether this statement is true or false.

Choose the correct answer below.

- ☒ True  
☐ False

4. Find the vertices and foci for the ellipse. Graph the equation.

$$\frac{x^2}{25} + \frac{y^2}{4} = 1$$

What are the coordinates of the vertices?

$(5,0), (-5,0)$

(Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

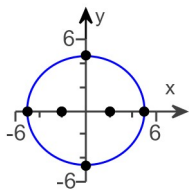
What are the coordinates of the foci?

$(\sqrt{21}, 0), (-\sqrt{21}, 0)$

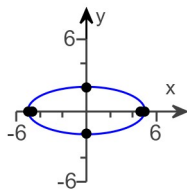
(Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

Which graph shown below is the graph of the ellipse?

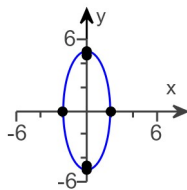
☐ A.



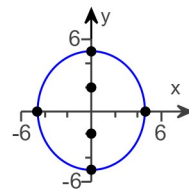
☒ B.



☐ C.



☐ D.



5. Watch the video and then solve the problem given below.

[Click here to watch the video.](#)<sup>1</sup>

Find the standard form of the equation of the ellipse that has vertex  $(0,13)$  and foci  $(0, \pm 5)$ .

The standard form of the equation of the ellipse is  $\frac{x^2}{144} + \frac{y^2}{169} = 1$ . (Type an equation.)

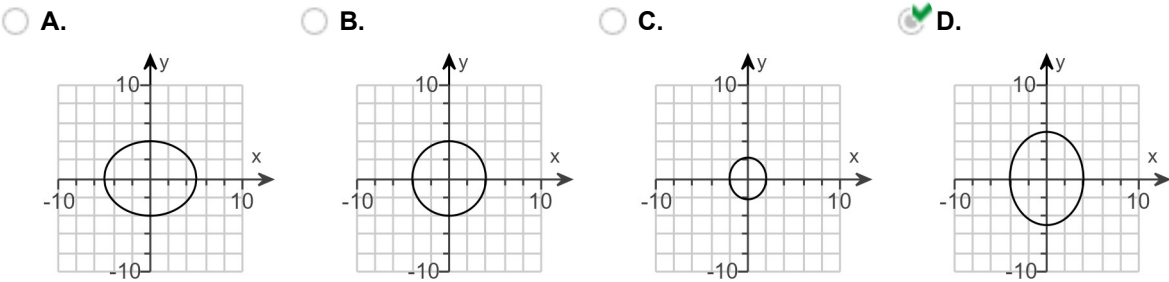
1: [http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se\\_oLO4a6vyjL?clip=1](http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se_oLO4a6vyjL?clip=1)

6. Watch the video and then solve the problem given below.

[Click here to watch the video.](#)<sup>2</sup>

Sketch a graph of the ellipse whose equation is  $25x^2 + 16y^2 = 400$  and specify the foci.

Choose the correct graph below.



The foci are  $(0, -3), (0, 3)$ .

(Use a comma to separate answers as needed. Type an ordered pair.)

2: [http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se\\_oLO4a6vyjL?clip=2](http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se_oLO4a6vyjL?clip=2)

7. Watch the video and then solve the problem given below.

[Click here to watch the video.](#)<sup>3</sup>

Write the equation of the ellipse given by  $9x^2 - 54x + 16y^2 + 64y + 1 = 0$  in standard form.

The equation of the ellipse in standard form is  $\frac{(x - 3)^2}{16} + \frac{(y + 2)^2}{9} = 1$ . (Type an equation.)

3: [http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se\\_oLO4a6vyjL?clip=4](http://mediaplayer.pearsoncmg.com/assets/rbN5SV9abzm5JVfnyB3se_oLO4a6vyjL?clip=4)

8. Find the vertices and foci for the ellipse. Graph the equation.

$$\frac{x^2}{36} + \frac{y^2}{25} = 1$$

What are the coordinates of the vertices?

$(6, 0), (-6, 0)$

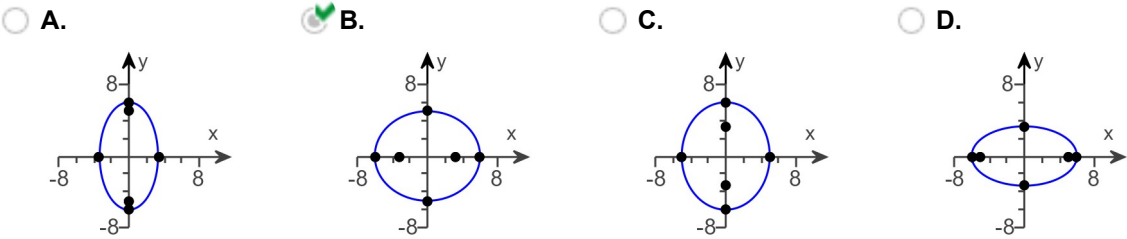
(Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

What are the coordinates of the foci?

$(\sqrt{11}, 0), (-\sqrt{11}, 0)$

(Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

Which graph shown below is the graph of the ellipse?



9.

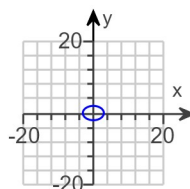
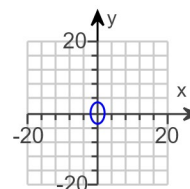
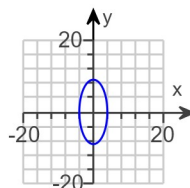
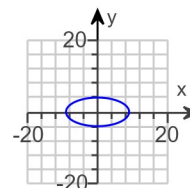
Find the vertices and the foci of the ellipse with the given equation. Then draw its graph.

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

What are the vertices of the ellipse?  $(0,3),(0,-3)$   
(Use a comma to separate answers. Type an ordered pair.)

What are the foci of the ellipse?  $(0,\sqrt{5}),(0,-\sqrt{5})$   
(Use a comma to separate answers. Type an ordered pair. Type an exact answer.)

Choose the correct graph of the ellipse.

☐ A.

☒ B.

☐ C.

☐ D.


10. Find the vertices and foci of the ellipse. Graph the equation.

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

What are the coordinates of the vertices?

$(2,0),(-2,0),(0,-2),(0,2)$

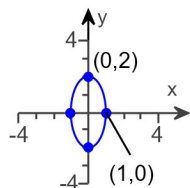
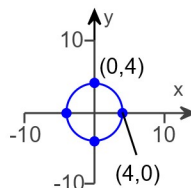
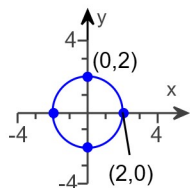
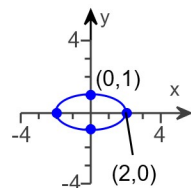
(Type an ordered pair. Use a comma to separate answers as needed.)

What are the coordinates of the foci?

$(0,0)$

(Type exact answers for each coordinate, using radicals as needed. Type an ordered pair. Use a comma to separate answers as needed.)

Choose the correct graph below.

☐ A.

☐ B.

☒ C.

☐ D.


11. Identify the vertices and foci of the following ellipse. Graph the ellipse.

$$x^2 + 81y^2 = 81$$

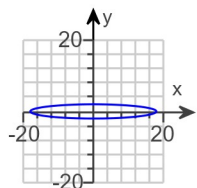
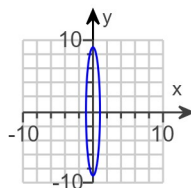
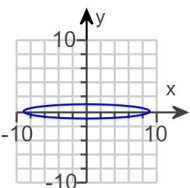
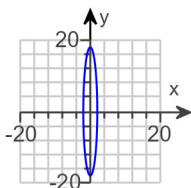
The vertices of the given ellipse are  $(-9,0),(9,0)$ .

(Simplify your answer. Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

The foci of the given ellipse are  $(-4\sqrt{5},0),(4\sqrt{5},0)$ .

(Simplify your answer. Type an ordered pair. Type exact answers for each coordinate, using radicals as needed. Use a comma to separate answers as needed.)

Choose the correct graph below.

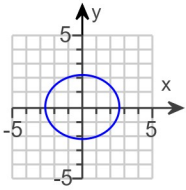
☐ A.

☐ B.

☒ C.

☐ D.


12. Graph the ellipse and locate the foci.

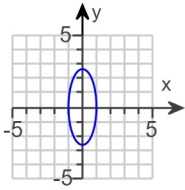
$$7x^2 = 35 - 5y^2$$

Choose the correct graph of the ellipse.

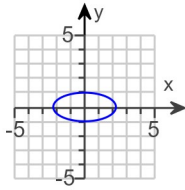
☐ A.



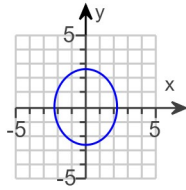
☐ B.



☐ C.



☒ D.



The foci of the ellipse are  $(0, \sqrt{2})$ ,  $(0, -\sqrt{2})$ .

(Use a comma to separate answers as needed. Type ordered pairs. Type exact answers, using radicals as needed.)

13.

Find the equation of the ellipse, centered at the origin, satisfying the conditions. Sketch its graph.

foci  $(\pm 3, 0)$ , vertices  $(\pm 5, 0)$

Choose the correct equation of the ellipse.

☒ A.  $\frac{x^2}{25} + \frac{y^2}{16} = 1$

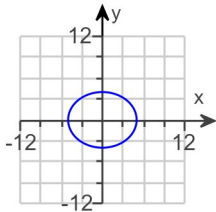
☐ B.  $\frac{x^2}{34} + \frac{y^2}{25} = 1$

☐ C.  $\frac{x^2}{16} + \frac{y^2}{25} = 1$

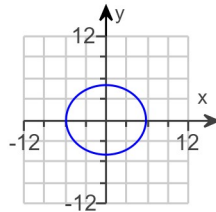
☐ D.  $\frac{x^2}{25} + \frac{y^2}{34} = 1$

Choose the correct graph of the ellipse.

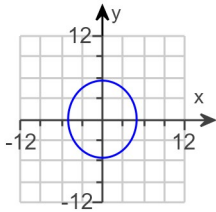
☒ A.



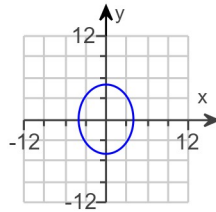
☐ B.



☐ C.



☐ D.



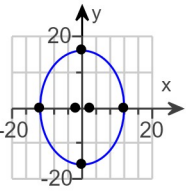
14. Find the standard form of the equation for the ellipse with foci  $(0, \pm 2)$ , and vertex  $(0, 4)$ . Graph the equation.

The equation of the ellipse in the standard form is  $\frac{x^2}{12} + \frac{y^2}{16} = 1$ .

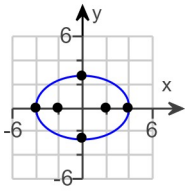
(Type exact answers, using radicals as needed. Use integers or fractions for any numbers in the equation.)

Choose the correct graph below.

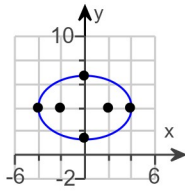
☐ A.



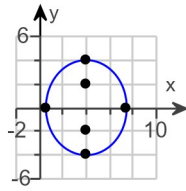
☐ B.



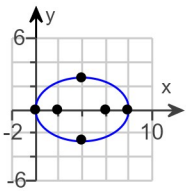
☐ C.



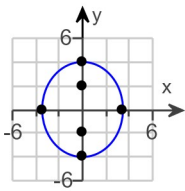
☐ D.



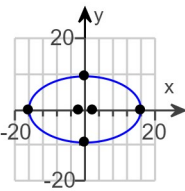
☐ E.



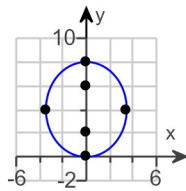
☒ F.



☐ G.

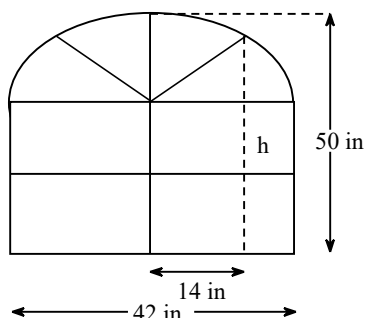


☐ H.



15.

A window is constructed with the top half of an ellipse on top of a square. The square portion of the window has a 42 inch base. If the window is 50 inches tall at its highest point, find the height,  $h$ , of the window 14 inches from the center of the base.

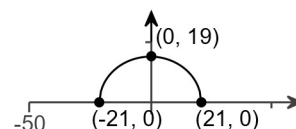


The height of the window 14 inches from the center of the base is  $h =$   inches.  
(Round to the nearest hundredth as needed.)

16. A bridge is built in the shape of a semielliptical arch. The bridge has a span of 160 feet and a maximum height of 30 feet. Choose a suitable rectangular coordinate system and find the height of the arch at a distance of 50 feet from the center.

The height is about  feet.  
(Round to two decimal places as needed.)

17. The elliptical ceiling of a building is 42 ft long and 19 ft tall. Use the rectangular coordinate system in the figure shown to write the standard form of the equation for the elliptical ceiling. A man discovered that he could hear conversations of colleagues in the entire room if he stood at the focus,  $(c, 0)$ , where  $c^2 = a^2 - b^2$ . How far along the major axis did the man stand to hear the conversations?



(a) The standard form of the equation is .

(b) The man stood  feet from the center of the ellipse.  
(Round to the nearest whole number.)

18. The vertical cross section of a dome is semi-elliptical in shape. The cross section is 300 feet long with a maximum height of 70 feet. Where should two people stand in order to maximize the whispering effect?

The people should stand on opposite sides of the room each being located at one of the foci located  feet from the wall.  
(Round to the nearest foot as needed.)

19. The standard equation of an ellipse with center  $(0,0)$ , vertices  $(0, \pm a)$ , and foci  $(0, \pm c)$  is  $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ , where  $b^2 = a^2 - c^2$ .

The eccentricity of an ellipse, denoted by  $e$ , is defined as follows.

$$e = \frac{\text{Distance between the foci}}{\text{Distance between the vertices}} = \frac{2c}{2a} = \frac{c}{a}$$

Find the eccentricity of the ellipse  $\frac{x^2}{27} + \frac{y^2}{36} = 1$ .

$e =$   (Type an integer or a simplified fraction.)