Precalculus
Quarter 1 – Module 2: Parabolas
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Precalculus
Quarter 1 – Module 2:
Parabolas
INTRODUCTORY MESSAGE

For the Facilitators:

Welcome to Precalculus Module 2: Parabolas.

Department of Education, as one of the significant stakeholders of learning, researched and explored innovative ways on how to address the learners' need of education amidst today's circumstance. DepEd initiated the making of Alternative Delivery Mode of teaching using teacher-made educational modules.

The role of facilitator is to support, help, and guide the learners in accomplishing all the tasks in all modules. This is a Precalculus subject, one of the specialized subjects in the STEM strand, which demands a lot of time and effort for the learners to study. Boosting the learners' focus and determination will really help them complete the module. Facilitators are anticipated to persuade learners to comply and to finish the modules on or before the scheduled time.

For the Learners:

The key to successfully finish this module lies in the learners' hands. This module is especially crafted for the learners to grasp the opportunity to continue learning diligently, intelligently, and independently even at home. Learners are expected to meet the Most Essential Learning Competencies (MELCs) specified in each lesson.

This module is focused on:

- Lesson 3 – Parabolas

This module has the following parts and corresponding icons:

- **WHAT I NEED TO KNOW.** The first part of the module will keep the learners be on tract with the Most Essential Learning Competencies (MELCs), Objectives, and Skills expected of them to develop and master.

- **WHAT I KNOW.** This part aims to check the learners' prior knowledge on the lesson to take through a pre-assessment.

- **WHAT'S IN.** This part helps the learners link the previous lesson to the current one.

- **WHAT'S NEW.** This introduces the lesson to be partaken in a more enjoyable way. It may be through a story, a song, a poem, a problem opener, an activity, a situation, or the like.

- **WHAT IS IT.** This gives a brief discussion of the lesson. It guides and helps the learners unlock the lesson presented.
WHAT’S MORE. This part solidifies the learners’ knowledge and skills of the given topic through comprehensive activities.

WHAT I HAVE LEARNED. This helps the learners process their learning and understanding on the given topic.

WHAT I CAN DO. A transfer of newly acquired knowledge and skills to a real-life situation is present in this part of the module.

ASSESSMENT. This 15–item test assesses the learners’ level of mastery towards the featured topic.

ADDITIONAL ACTIVITIES. This part of the module let the learners enhance their learning of the topic.

Here are some rules for the learners to follow in accomplishing the modules.

1. The learners should schedule and manage their time to read and understand every part of the module.

2. The learners should study how they can manage to do the activities of this subject in consideration of their other modules from other subjects.

3. The learners should finish one task at hand before proceeding to the next.

4. This module is organized according to the learners’ level of understanding. Skipping one part of this module may lead them to confusion and misinterpretation.

5. If learners do not understand the activities and other tasks, they should re-read and engage all possible resources. They may ask other family members to help them.

6. Learners should not procrastinate.

7. Learners are free to browse and read other different materials.

8. Learners should not copy their classmates’ answers through asking for screenshots of their answers online. In this independent type of learning, honesty is always the best policy.

9. Lastly, learners should do the module on their own. Family members and friends at home may support the learners but the activities must be done by themselves.
Hi! I am Sir Leigh.
Welcome to Module 2, Lesson 3 of Precalculus.
I am pleased to be your guide as you walk through this module.
Are you ready?

A parabola is one of the conic sections. Parabolas have many important applications. They are used in the design of parabolic mirrors, searchlights, and automobile headlights. The path of a projectile is a parabola if motion is in a plane and air resistance is neglected. Arches are sometimes parabolic in appearance; and the cable of a suspension bridge could hang in the form of a parabola. Dish antennas for receiving satellite television signals are also parabolic in shape.

You have already seen parabolas which open upward or downward, as graphs of quadratic functions. Here, we will see parabolas opening to the left or right.

Most Essential Learning Competencies (MELCs):

❖ define a parabola. (STEM_PC11AG-la-5)
❖ determine the standard form of equation of a parabola. (STEM_PC11AG-lb-1)

Learning Objectives:

In this lesson, you are expected to...

❖ define a parabola.
❖ derive the eight standard forms of equation of a parabola.
❖ investigate the characteristics of a parabola through paper folding.
❖ relate parabolas to real–life scenarios.
Before we proceed to the lesson proper, I need to check your initial knowledge on parabolas. Good luck!

Pre-assessment

Directions: Read and answer this 15–item test carefully. Encircle the letter of your choice.

1. This line divides the parabola into two parts which are mirror images of each other.
   A. Vertex  
   B. Directrix  
   C. Focus  
   D. Axis of Symmetry
2. Which of the following statements about parabola is FALSE?
   A. If the parabola opens upward, the vertex is the lowest point.
   B. If the parabola opens downward, the vertex is the highest point.
   C. Any point on the parabola has the same distance from the focus as it has from the vertex.
   D. The axis of symmetry divides the parabola into two parts which are mirror images of each other.
3. What is the standard equation of a parabola opening upward with vertex (0, 0)?
   A. \( x^2 = 4cy \)
   B. \( x^2 = -4cy \)
   C. \( y^2 = 4cx \)
   D. \( y^2 = -4cx \)
4. Considering the direction of the graph of the parabolas, which of the following equations does not belong to the group?
   A. \( x^2 = 12y \)
   B. \( x^2 - 6x + 5y = -34 \)
   C. \( x^2 = -6y \)
   D. \( x^2 + 6x + 8y = 7 \)
5. Which of the following equations of a parabola opens upward?
   A. \( y^2 = 8x \)
   B. \( y^2 = -x \)
   C. \( x^2 = -4y \)
   D. \( x^2 = 10y \)
6. Which of the standard equation of a parabola has a center at origin?
   A. \( 3y^2 - 24x = 0 \)
   B. \( x^2 + 6x + 8y = 7 \)
   C. \( y^2 - 12x + 8y = -40 \)
   D. \( 16x^2 + 72x - 122y = -221 \)
7. What is the standard equation of the parabola with focus \( F(7,11) \) and directrix \( x = 1 \)?
   A. \( (y - 11)^2 = 12(x - 4) \)
   B. \( (x + 4)^2 = -12(y - 2) \)
   C. \( (y - 3)^2 = 10(x + 8) \)
   D. \( (y + 9)^2 = -16(x - 1) \)
8. What is the standard equation of the parabola with vertex \( V(1, -9) \) and focus \( F(-3, -9) \)?
   A. \((y - 11)^2 = 12(x - 4)\)
   B. \((x + 4)^2 = -12(y - 2)\)
   C. \((y - 3)^2 = 10(x + 8)\)
   D. \((y + 9)^2 = -16(x - 1)\)

9. What is the standard equation of the parabola in the figure?
   A. \(x^2 = 8y\)
   B. \(x^2 = -8y\)
   C. \(y^2 = 8x\)
   D. \(y^2 = -8x\)

10. A parabola has focus \( F'(7, 9) \) and directrix \( y = 3 \). Find its standard equation.
    A. \((x + 2)^2 = 12(y + 3)\)
    B. \((x - 2)^2 = 12(y - 3)\)
    C. \((x + 7)^2 = 12(y + 6)\)
    D. \((x - 7)^2 = 12(y - 6)\)

11. Determine the directrix of the parabola with equation \( y^2 - 12x + 8y = -40 \).
    A. \(x = 2\)
    B. \(x = -1\)
    C. \(y = -2\)
    D. \(y = -4\)

12. Determine the focus of the parabola with equation \( x^2 = 12y \).
    A. \(F(0, 0)\)
    B. \(F(0, 3)\)
    C. \(F(0, -3)\)
    D. \(F(0, 12)\)

13. Determine the directrix of the parabola with equation \( x^2 = -6y \).
    A. \(y = 0\)
    B. \(y = \frac{7}{5}\)
    C. \(y = 1\)
    D. \(y = \frac{3}{2}\)

14. Determine the vertex of the parabola with equation \( y^2 - 12x + 8y = -40 \).
    A. \(V(0, 0)\)
    B. \(V(2, -4)\)
    C. \(V(-3, 2)\)
    D. \(V(-2.25, 1.25)\)

15. Determine the axis of symmetry of the parabola with equation \( 3y^2 = 24x \).
    A. \(x = 0\)
    B. \(y = 0\)
    C. \(x = -1\)
    D. \(y = -1\)
Let us recall your knowledge on Distance Formula through answering a short drill.

Find the distance of $AB$ and $CB$. Compare both distances.

$A(-2, 2)$
$B(2, 5)$
$C(2, 0)$

**Solution:**
Now, it is time for some analysis.

Compare the shapes of the three parabolas and answer the question in Worksheet 1.
CONGRATS IN COMPLETING THE ACTIVITY OF LESSON 3.

If you are already curious on what’s more on parabolas, discussions are in the next pages.

WORKSHEET 1

Comparing the shapes of the three parabolas, how does the distance between the focus and the directrix affect the shape of a parabola?

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At this point, have you asked the following questions?

What is the formal definition of a parabola?
What are the different features of a parabola?
How do the other forms of parabola in terms of opening differ from the parabola I knew in junior high school?
Do each kinds of parabola have the same form of equation?

WHAT IS IT
All your questions will be answered in this part.

From the figure in WHAT'S IN, we got $AB = 5 = CB$ through computing each segment’s length with the distance formula.

There are other points $P$ such that $PA = EP$. Both points $C$ and $E$ are on the line $L$.

This will lead us to our first objective of this lesson which is the definition of the parabola.

**DEFINITION OF A PARABOLA**

Let $F$ be a fixed point, and $\ell$ be a fixed line not containing $F$. The set of all points $P$ such that its distances from $F$ and from $\ell$ are the same, is called a parabola. The fixed point $F$ is called the focus, and the fixed line $\ell$ is called the directrix.
Consider a parabola on the left with focus $F(0, c)$ and directrix $\ell$ having equation $y = -c$. The focus and directrix are $c$ units above and below, respectively, the origin.

Let $P(x, y)$ be a point on the parabola. The distance from this point to the focus must be the same as the distance from this point to the directrix.

We have $FP = P_\ell P$.

Note that the distance from a point on the parabola to the directrix is measured along the perpendicular from the point to the line.

Through all these, we can derive the standard form of equation of a parabola.

**Derivation of the Standard Form of Equation of a Parabola**

opening upwards with vertex $V(0, 0)$

$$FP = P_\ell P$$

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\sqrt{(x - 0)^2 + (y - c)^2} = \sqrt{(x - x)^2 + [y - (-c)]^2}$$

$$\sqrt{x^2 + (y - c)^2} = \sqrt{(y + c)^2}$$

$$\sqrt{x^2 + y^2 - 2cy + c^2} = \sqrt{y^2 + 2cy + c^2}$$

$$x^2 + y^2 - 2cy + c^2 = y^2 + 2cy + c^2$$

$$x^2 = 2cy$$

$$x^2 = 4cy$$

Distance Formula for both segments

Substitute corresponding points

Simplify: $(x - 0)^2 = x^2$ and $(x - x)^2 = 0$

Simplify: $(y - c)^2 = y^2 - 2cy + c^2$ and $(y + c)^2 = y^2 + 2cy + c^2$

Square each side

Simplify: Cancel same terms on both sides

Addition Property of Equality

Oh! So that is how the first standard form of equation of the parabola started. There are seven equations more but that is for you to derive. Wait for that in the later part of the lesson.

I will present all eight standard forms of equation in the next pages and some illustrative examples for you. Enjoy!
STANDARD FORM OF EQUATION OF A PARABOLA

Opening upwards with vertex $V(0, 0)$

$$x^2 = 4cy$$

Opening downwards with vertex $V(0, 0)$

$$x^2 = -4cy$$

Opening to the right with vertex $V(0, 0)$

$$y^2 = 4cx$$

Opening to the left with vertex $V(0, 0)$

$$y^2 = -4cx$$
Opening upwards with vertex $V(h, k)$

$$(x - h)^2 = 4c(y - k)$$

Opening downwards with vertex $V(h, k)$

$$(x - h)^2 = -4c(y - k)$$

Opening to the right with vertex $V(h, k)$

$$(y - k)^2 = 4c(x - h)$$

Opening to the left with vertex $V(h, k)$

$$(y - k)^2 = -4c(x - h)$$
Example: In each item, give the standard form of equation of the parabola satisfying the given conditions.

1. parabola in the figure in WHAT’S IN

From the figure, we deduce that $V(-2, 2)$ and $c = 1$.

Standard Form of Equation of a Parabola opening upwards with vertex $(h, k)$

$[x - (-2)]^2 = 4(1)(y - 2)$

Simplify

$(x + 2)^2 = 4(y - 2)$

2. vertex $(1, 9)$ and focus $(-3, -9)$

If you have difficulties, it is helpful if you draw a diagram.

However, to get the value of $c$, simply get the distance from the vertex to focus.

The value of $c$ is 4.

Standard Form of Equation of a Parabola opening to the left with vertex $(h, k)$

$(y - 9)^2 = -4(4)(x - 1)$

Simplify

$(y - 9)^2 = -16(x - 1)$
3. vertex \((-8, 3)\) and directrix \(x = 10.5\)

Since we are asked to find the standard equation of the parabola, we just want to know the opening of the parabola through the given conditions.

From the figure, we deduce that the parabola is opening to the left. To get the value of \(c\), you can manually count through your drawing or get the distance from \(V(-8, 3)\) to \((10.5, 3)\).

We have, \(c = 18.5\)

\[
(y - k)^2 = -4c(x - h) \quad \text{Standard Form of Equation of a Parabola}
\]

opening to the left with vertex \((h, k)\)

\[
(y - 3)^2 = -4(18.5)[x - (-8)] \quad (h, k) = (-8, 3) \text{ and } c = 18.5
\]

\[
(y - 3)^2 = -74(x + 8) \quad \text{Simplify}
\]

4. parabola opens downwards, vertex at the origin, and \(c = 6\)

\[
x^2 = -4cy \quad \text{Standard Form of Equation of a Parabola}
\]

opening downwards with vertex \((0, 0)\)

\[
x^2 = -4(6)y
\]

\[
x^2 = -24y \quad \text{Simplify}
\]

5. parabola opens to the right, vertex \(V(1, 0)\), and \(c = 2\)

\[
(y - k)^2 = 4c(x - h) \quad \text{Standard Form of Equation of a Parabola}
\]

opening to the right with vertex \((h, k)\)

\[
(y - 0)^2 = 4(2)(x - 1)
\]

\[
y^2 = 8(x - 1) \quad \text{Simplify}
\]
More Examples: Rewrite the general equation of a parabola to its standard form. Identify its vertex.

6. \( y^2 - 5x + 12y = -16 \)

Solution:

\[
\begin{align*}
\text{Original equation} & : y^2 - 5x + 12y = -16 \\
\text{Sort all terms} & : y^2 + 12y = 5x - 16 \\
\text{Complete the square} & : y^2 + 12y + 36 = 5x - 16 + 36 \\
\text{Simplify} & : (y + 6)^2 = 5(x + 4) \\
\text{Factor} & : \\
\text{Vertex } V(-4, -6) & 
\end{align*}
\]

7. \( 3x^2 + 24x - y + 50 = 0 \)

Solution:

\[
\begin{align*}
\text{Original equation} & : 3x^2 + 24x - y + 50 = 0 \\
\text{Sort all terms} & : 3x^2 + 24x = y - 50 \\
\text{Factor 3 on the left side} & : 3(x^2 + 8x + 16) = y - 50 + 3(16) \\
\text{Complete the square} & : 3(x + 4)^2 = y - 2 \\
\text{Simplify} & : (x + 4)^2 = \frac{1}{3}(y - 2) \\
\text{Divide each side by 3} & : \\
\text{Vertex } V(-4, 2) & 
\end{align*}
\]

8. \( y^2 - x + 14y = -20 \)

Solution:

\[
\begin{align*}
\text{Original equation} & : y^2 - x + 14y = -20 \\
\text{Sort all terms} & : y^2 + 14y = x - 20 \\
\text{Complete the square} & : y^2 + 14y + 49 = x - 20 + 49 \\
\text{Simplify} & : (y + 7)^2 = x + 29 \\
\text{Vertex } V(-29, -7) & 
\end{align*}
\]
How are parabolas so far? I bet you need more of the conic!

In the activity (WHAT'S NEW) parabola fold, you have already realized that, respectively, the focus and directrix are $c$ units above and below the origin.

Here are the more of the features of a parabola.

---

**FEATURES OF A PARABOLA**

1. **VERTEX.** This is the intersection of the parabola with its axis. If the parabola opens upward, the vertex is the lowest point. If the parabola opens downward, the vertex is the highest point.

2. **FOCUS.** The focus is $c$ units from the vertex.

3. **DIRECTRIX.** The directrix is $c$ units from the vertex.

4. **AXIS OF SYMMETRY.** This is the line through the focus perpendicular to the directrix. This line divides the parabola into two parts which are mirror image of each other.

5. **OPENING.** In this lesson, parabolas open upwards, downwards, to the right, or to the left.

6. **LATUS RECTUM.** This is the line segment through the focus and perpendicular to the axis of symmetry. The length of the latus rectum of a parabola is $|4c|$. 

---
**Example 9:** For the parabola having the equation $x^2 = -8y$, identify all its features.

a. Vertex  
b. Focus  
c. Directrix  
d. Axis of Symmetry  
e. Opening  
f. Endpoints of the Latus Rectum

Solution:

a. The given equation is a parabola whose vertex is at the origin and opens downwards.  
b. Since $-4c = -8$, then $c = 2$. The focus is at the point $F(0, -2)$.  
c. The equation of the directrix is $y = 2$.  
d. Since the vertex is at the origin and the parabola opens downwards, the axis of symmetry is the $y$-axis or $x = 0$.  
e. The parabola opens downwards.  
f. Since $-4c = -8$, then $4c = 8$. So, the length of the latus rectum is 8. The endpoints of the latus rectum are $(-4, -2)$ and $(4, -2)$. 

It is helpful that you graph the parabola for better reference of its features.
Now, it is your turn!

Let us check your knowledge and skills in solving the following problems on parabolas. Everything you learned in the previous pages will be used in this worksheet.

**WORKSHEET 2**

Answer the following problems. Show your solution.

1. Find the standard form of equation of the parabola opening to the left with vertex $V(4, -3)$ and $c = 5$.
2. Find the standard form of equation of the parabola with focus $F(0, 3.5)$ and directrix $y = -3.5$.
3. Find the standard form of equation of the parabola with vertex $V(-4, 2)$ and focus $F(-4, -1)$.
4. Rewrite the general equation of the parabola $4x - y^2 = 2y + 13$ to its standard form. Identify the vertex.
5. Identify all the features of the parabola with equation $y^2 = 12x$.

**Answers and solutions in Worksheet 2:**
We are almost done with Module 2. Now, I want to solidify what you have learned through answering the succeeding worksheets. In Worksheet 3, analyze a problem and find the error. In Worksheet 4, apply what you have learned on Parabolas to real–life situations.

And you are ready for Assessment!

**WORKSHEET 3**

Kadita is finding the standard form of the equation \( y = x^2 + 6x + 4 \). What mistake did she make in her work?

\[
\begin{align*}
y &= x^2 + 6x + 4 \\
y &= x^2 + 6x + 9 + 4 \\
y &= (x + 3)^2 + 4
\end{align*}
\]

**WORKSHEET 4**

A microphone is placed at the focus of a parabolic reflector to collect sound for the television broadcast of a World Cup soccer game. Write an equation for the cross section, assuming that the focus is at the origin and the parabola opens to the right.
Directions: Read and answer this 15–item test carefully. Encircle the letter of your choice.

1. Which of the following statements about parabola is FALSE?
   A. If the parabola opens upward, the vertex is the lowest point.
   B. If the parabola opens downward, the vertex is the highest point.
   C. Any point on the parabola has the same distance from the focus as it has from the vertex.
   D. The axis of symmetry divides the parabola into two parts which are mirror images of each other.

2. This is the line through the focus perpendicular to the directrix.
   A. Directrix
   B. Parabola
   C. Latus Rectum
   D. Axis of Symmetry

3. What is the standard equation of a parabola opening to the right with vertex $(0, 0)$?
   A. $x^2 = 4cy$
   B. $x^2 = -4cy$
   C. $y^2 = 4cx$
   D. $y^2 = -4cx$

4. Considering the direction of the graph of the parabolas, which of the following equations does not belong to the group?
   A. $x^2 = 12y$
   B. $x^2 - 6x + 5y = -34$
   C. $x^2 = -6y$
   D. $x^2 + 6x + 8y = 7$

5. Which of the following equations of a parabola opens upwards?
   A. $y^2 = 8x$
   B. $y^2 = -x$
   C. $x^2 = -4y$
   D. $x^2 = 10y$

6. Which of the following standard equation of a parabola has a center at origin?
   A. $3y^2 - 24x = 0$
   B. $x^2 + 6x + 8y = 7$
   C. $y^2 - 12x + 8y = -40$
   D. $16x^2 + 72x - 122y = -221$

7. What is the standard equation of the parabola with focus $F(7, 11)$ and directrix $x = 1$?
   A. $(y - 11)^2 = 12(x - 4)$
   B. $(x + 4)^2 = -12(y - 2)$
   C. $(y - 3)^2 = 10(x + 8)$
   D. $(y + 9)^2 = -16(x - 1)$
8. What is the standard equation of the parabola with vertex $V(1, -9)$ and focus $F(-3, -9)$?
   A. $(y - 11)^2 = 12(x - 4)$
   B. $(x + 4)^2 = -12(y - 2)$
   C. $(y - 3)^2 = 10(x + 8)$
   D. $(y + 9)^2 = -16(x - 1)$

9. What is the standard equation of the parabola in the figure?
   A. $x^2 = 8y$  
   B. $x^2 = -8y$  
   C. $y^2 = 8x$  
   D. $y^2 = -8x$

10. A parabola has focus $F(7, 9)$ and directrix $y = 3$. Find its standard equation.
    A. $(x + 2)^2 = 12(y + 3)$
    B. $(x - 2)^2 = 12(y - 3)$
    C. $(x + 7)^2 = 12(y + 6)$
    D. $(x - 7)^2 = 12(y - 6)$

11. Determine the directrix of the parabola with equation $y^2 - 12x + 8y = -40$.
    A. $x = 2$
    B. $x = -1$
    C. $y = -2$
    D. $y = -4$

12. Determine the focus of the parabola with equation $x^2 = 12y$.
    A. $F(0, 0)$
    B. $F(0, 3)$
    C. $F(0, -3)$
    D. $F(0, 12)$

13. Determine the directrix of the parabola with equation $x^2 = -6y$.
    A. $y = 0$
    B. $y = \frac{7}{5}$
    C. $y = 1$
    D. $y = \frac{3}{2}$

14. Determine the vertex of the parabola with equation $y^2 - 12x + 8y = -40$.
    A. $V(0, 0)$
    B. $V(2, -4)$
    C. $V(-3, 2)$
    D. $V(-2.25, 1.25)$

15. Determine the axis of symmetry of the parabola with equation $3y^2 = 24x$.
    A. $x = 0$
    B. $y = 0$
    C. $x = -1$
    D. $y = -1$
Here is an additional task I want you to do.

As promised, I want you to derive the remaining standard form of equations of the parabola. However, I will only ask you to **derive two** of the remaining seven. Choose one from each group below.

<table>
<thead>
<tr>
<th>GROUP A</th>
<th>GROUP B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(x - h)^2 = 4c(y - k)$</td>
</tr>
<tr>
<td>$x^2 = -4cy$</td>
<td>$(x - h)^2 = -4c(y - k)$</td>
</tr>
<tr>
<td>$y^2 = 4cx$</td>
<td>$(y - k)^2 = 4c(x - h)$</td>
</tr>
<tr>
<td>$y^2 = -4cx$</td>
<td>$(y - k)^2 = -4c(x - h)$</td>
</tr>
</tbody>
</table>

**A:**

**B:**

---

Good Job in completing Lesson 3, Module 2.
WHAT I KNOW

1. D
2. C
3. A
4. A
5. D
6. A
7. A
8. D
9. A
10. D
11. B
12. B
13. D
14. B
15. A

WHAT'S MORE

1. \((y + 3)^2 = -20(x - 4)\)
2. \((x - 2)^2 = -12(y + 4)\)
3. \((x - 4)(y + 1) = 4\)
4. \(y = x^2 = 6A\)
5. \(V(0, 3), F(3, 0)\)
6. Focus: \((13, 0)\)
7. Axis: \(y = 0\)
8. Directrix: \(x = 3\)
9. Opening: right
10. LR: \((3, -6)\) and \((3, 6)\)

ASSSESSMENT

1. C
2. D
3. C
4. A
5. D
6. A
7. A
8. D
9. A
10. B
11. B
12. B
13. D
14. A
15. A

WHAT I KNOW

1. B
2. B
3. A
4. A
5. C
6. C
7. D
8. C
9. B
10. B
11. B
12. B
13. D
14. B
15. B

ANSWER KEY
REFERENCES


Most Essential Learning Competencies


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