

**Just In Time Quick Check**  
**Standard of Learning (SOL) AII.7i**

**Strand: Functions**

**Standard of Learning (SOL) AII.7i**

*The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include vertical and horizontal asymptotes.*

**Grade Level Skills:**

- Determine the equations of vertical and horizontal asymptotes of functions (rational, exponential, and logarithmic).
- Investigate and analyze characteristics and multiple representations of functions with a graphing utility.

**Just in Time Quick Check**

**Just in Time Quick Check Teacher Notes**

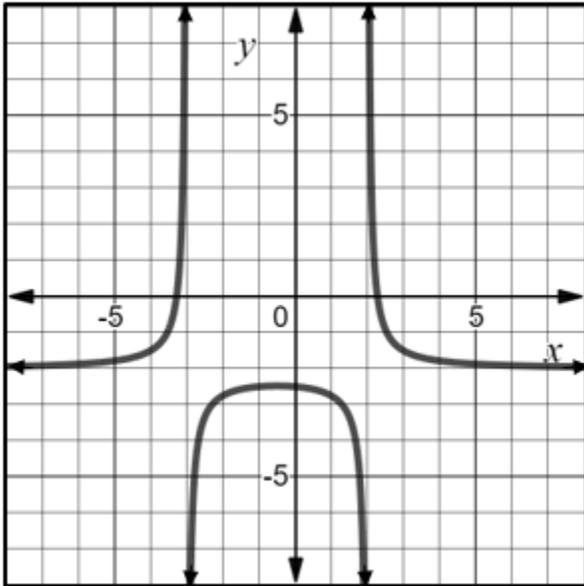
**Supporting Resources:**

- VDOE Mathematics Instructional Plans (MIPS)
  - [All.7adei - Intercepts, Asymptotes, and Discontinuity of Functions](#) (Word) / [PDF Version](#)
- VDOE Word Wall Cards: Algebra II ([Word](#)) | ([PDF](#))
  - Discontinuity (asymptotes)
  - Parent Functions (Rational)
  - Parent Functions (Exponential, Logarithmic)
  - Vertical Line
  - Horizontal Line
- Desmos Activity
  - [Asymptotes of Rational Functions](#)

**Supporting and Prerequisite SOL:** [All.6a](#), [All.7a](#), [A.7b](#), [8.15b](#)

### SOL All.7i - Just in Time Quick Check

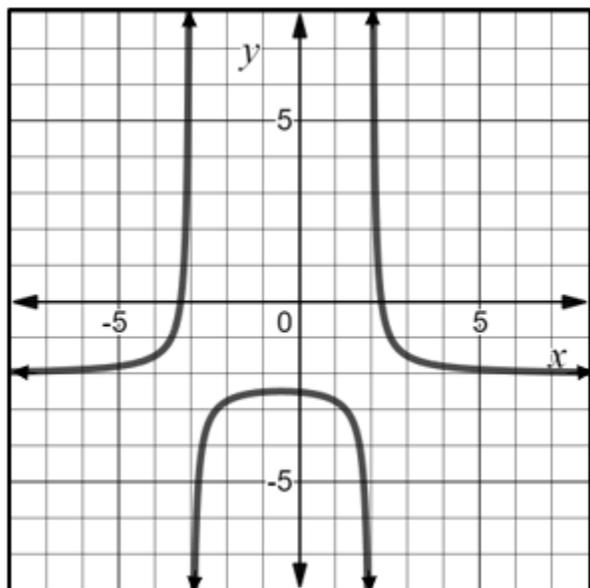
1. The graph of the function  $g(x)$  is shown. Determine and describe the asymptote(s) of the function  $g(x)$ . Using a dotted line, sketch the asymptote(s) on the graph. Label each asymptote.



2. What are the equation(s) of the vertical asymptote(s) of the graph of the function  $y = \frac{x+4}{x^2-16}$ ?
3. What is the equation of the horizontal asymptote of the graph of the function  $f(x) = 2^{(x-3)} - 5$ ?
4. Determine and describe the asymptote(s) of the function  $f(x) = 2 \log(x - 1)$ .

**SOL All.7i - Just in Time Quick Check Teacher Notes**  
**Common Errors/Misconceptions and their Possible Indications**

1. The graph of the function  $g(x)$  is shown. Determine and describe the asymptote(s) of the function  $g(x)$ . Using a dotted line, sketch the asymptote(s) on the graph. Label each asymptote.



*A common error that some students may make is to list the horizontal asymptotes as  $x = -3$  and  $x = 2$  and the vertical asymptote as  $y = -2$ . This may indicate a misunderstanding of which asymptotes are horizontal and which asymptotes are vertical. Other students may correctly identify the horizontal and vertical asymptotes, but have a misunderstanding in how to write the equations of horizontal and vertical lines. For example, they may write  $y = -3$  and  $y = 2$  as the vertical asymptotes. The teacher may wish to review with the student the difference between horizontal and vertical lines, using the VDOE Word Wall cards. Having students use Desmos to graph asymptotes, when given the graph of a function, might help students discern the difference between horizontal and vertical asymptotes.*

2. What are the equation(s) of the vertical asymptote(s) of the graph of the function  $y = \frac{x+4}{x^2-16}$ ?

*A common error that some students may make is to state that the equations of the vertical asymptotes are  $x = 4$  and  $x = -4$ . This may indicate that the student has a misconception about the removable discontinuities (holes) in a rational function that can occur when the numerator and denominator share a binomial factor. A strategy that could be used is to have the student practice graphing rational functions using the original equation and the simplified form to see that the graphs appear the same. Teachers should be sure to make the connection between finding the undefined domain values that occur when the denominator of the function is set equal to zero and the asymptotes/holes of the function.*

3. What is the equation of the horizontal asymptote of the graph of the function  $f(x) = 2^{(x-3)} - 5$ ?

*A common error that some students may make is to state that the equation of the horizontal asymptote is  $y = 0$ . This may indicate the student has a misconception that the horizontal asymptote is  $y = 0$  and does not recognize that transformations of the function based on the parameters of the equation will affect the location of the*

*asymptote. One strategy that could be used is to have the student practice graphing exponential functions using a table of values to observe how the parameters of the function affect the location of the horizontal asymptote.*

4. Determine and describe the asymptote(s) of the function  $f(x) = 2 \log(x - 1)$ .

*A common error some students may make is to think the vertical asymptote is at  $x=-1$ . These students recognize this logarithmic function has a horizontal shift, but mistakenly think it is a horizontal shift left. Teachers may wish to use Desmos to provide a visual illustration of a horizontal shift  $c$  unit(s) in the opposite direction of the sign on  $c$ .*